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CARDIOSPASM

REPORT OF TWO CASES WITH POSTMORTEM OBSERVATIONS

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Spasm of the esophagus has been recognized clinically since the early part of the nineteenth century. The term cardiospasm was first used in 1882 by Mikulicz in describing obstructions which he considered to be due to a simple spasm at the cardiac orifice. Today cardiospasm is looked on as a condition which results from a spasm of the lower end of the esophagus—not of the cardiac opening but of the cardiac sphincter. Achalasia, which means absence of relaxation, is a term used by some to replace cardiospasm and obviate any etiologic designation. A review of the literature brings out the fact that there is no complete agreement as to the cause of the dilatation of the esophagus.

It was originally intended to report the findings in one patient who had been under my observation and who died of cardiospasm. It was felt that this would be of interest since so few patients die of cardiospasm. Since then another patient with cardiospasm who was under my observation eight years ago came to autopsy, so the second report is included. These reports are made not because of new observations but merely to add to the relatively small list of reports of postmortem observations on cardiospasm. Eventually definite conclusions may be drawn from this gradually increasing list.

ANATOMIC CONSIDERATIONS

The esophagus is a tube lined with squamous mucous membrane surrounded by a muscular coat which is arranged in two layers, an inner layer of circular fibers and an outer layer of longitudinal fibers. This muscular coat is uniform throughout the length of the esophagus. In the upper third the muscle is striated and strong. In the lower two-thirds it is unstriated or smooth and yielding. The striated muscle is supplied from the recurrent laryngeal and cervical sympathetic nerves. The lower part of the esophagus (smooth muscle) is supplied from the vagus and sympathetic fibers with the addition of Auerbach's plexus for the lowest part.

Much confusion exists as to the presence of a sphincter at the cardia. It is now generally agreed that there is a cardiac sphincter. The last

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inch of the esophagus, including the whole of the abdominal portion, is sphincteric in action. The muscle coat is slightly thicker, and prominent longitudinal rugae of the mucous membrane are visible. However, there is no marked thickening of the circular fibers. Because of the tonus of the sphincter the walls of the esophagus are tightly in apposition. There are contraction and relaxation of the spasm synchronous with expiration and inspiration. Relaxation is initiated when swallowing occurs, and it likewise occurs with reverse peristaltic movements. The control of this part of the esophagus is maintained by the autonomic nervous system, which is known to be more responsive to psychic influences than is the central nervous system. Strong stimulation of the sensory nerves from the abdominal viscera reflexly produces spasm of the cardia. It should be emphasized that the cardiac sphincter is not at the anatomic cardia.

The term cardia refers to the junction of the esophagus with the stomach. Cardiac canal (or epicardia) is the name given to that part of the esophagus extending upward from the cardia to the level of the upper surface of the diaphragm. This cardiac canal, which is approximately 3 cm. in length, is divided into the abdominal, diaphragmatic and hiatal portions of the esophagus. It is in the hiatal portion, which is just above the diaphragm, rather than at the cardia, that cardiospasm is seen on examination with the endoscope.

CLINICAL COURSE

The course of the disease is too well known to require detailed description. It is twice as common in women as in men. The onset is usually insidious. The symptoms, which rarely begin before the age of 20 or after 40, are dysphagia, regurgitation, pain at the cardia and salivation. Diagnosis is made by means of roentgenograms taken after introduction of an opaque medium. The esophagus appears dilated, often to a marked degree. The dilatation is always more marked than that seen in obstruction from other causes, as in cancer. The dilated esophagus may be sausage-shaped, spindle-shaped or flask-shaped and rarely S-shaped (fig. 1), according to where the main dilatation is. The lower end of the dilated esophagus may be rounded, or it may be funnel-shaped and taper off into a filiform process which passes downward and to the left. The roentgenogram must be supplemented with a fluoroscopic examination to reveal the true picture. Figure 2 indicates an obstruction fully 2 inches (5 cm.) above the diaphragmatic hiatus, yet under the fluoroscope this obstruction changed from this level to the cardiac canal on numerous occasions. The endoscopic examination has added materially to the knowledge of this condition. When cardiospasm is present the attempt to pass the esophagoscope through the hiatal portion of the esophagus causes the folds of the mucous mem-

brane to be firmly approximated and the cardiac canal to close, which does not occur in the normal esophagus. Use of this instrument has further shown that the lower end of the esophagus is not in a state of constant spasmodic contraction. It has been noted in patients watched over a period of years that even when the symptoms have disappeared the dilatation has remained.

THEORIES OF CAUSATION

Jackson, whose popularization of the esophagoscope added materially to the knowledge of these conditions, stated that there is no spasm at the cardiac end of the esophagus and that all dilatation of the esophagus incident to spasm at its lower extremity is situated above the diaphragm. He further stated that the spasm is due to spasmodic contractions of specialized muscle fibers encircling the esophagus and that it is the result

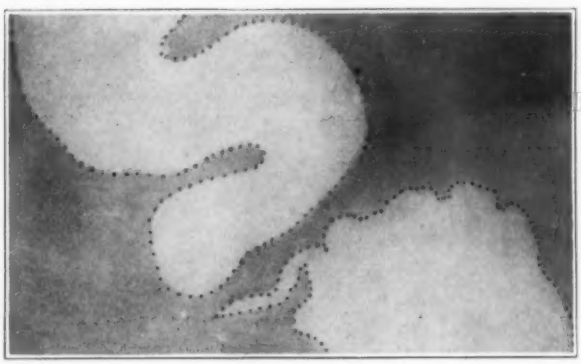

Fig. 1.—Roentgenogram of the lower end of the esophagus of a woman of 40 with symptoms of cardiospasm for six years. The elongation was so great as to form a U at the lower end, and the dilatation was so marked that it frequently caused embarrassment to respiration. Note the width of the cardiac canal as contrasted with that shown in the other roentgenograms. Owing to the age of the roentgenograms the outlines of the barium have been emphasized with black dots in all the roentgenograms.

of the failure of the "diaphragmatic pinchcock" to open normally in the deglutitory cycle. It is now known that this view is incorrect. On the other hand, Mosher expressed the belief that 75 per cent of all so-called cardiospasms are of organic origin. He felt that the most common cause was stricture of the terminal portion of the esophagus in the cone of the diaphragm resulting from an inflammatory process (fig. 3). The next most common cause he believed to be the result of the formation of a trap in the terminal portion of the esophagus caused by falling of the diaphragm, and, last, he considered that compressive stenosis due to hepatic abnormalities may simulate spasmodic stenosis. Since making

these statements Mosher has clarified his views as the result of extensive anatomic and pathologic studies. He has concluded that cardiospasm is the result of a chronic inflammatory reaction in the esophagus from some intra-abdominal infection.

There may be a congenital basis for a few of the cases of cardiospasm, but this has not been generally accepted as a cause.

The reflex origin from neighboring disease conditions, such as carcinoma and disease of the gallbladder, is generally accepted, but this accounts for only a small proportion of the cases. Usually the dilatation of the esophagus is much less than it is in the so-called idiopathic cases of cardiospasm.

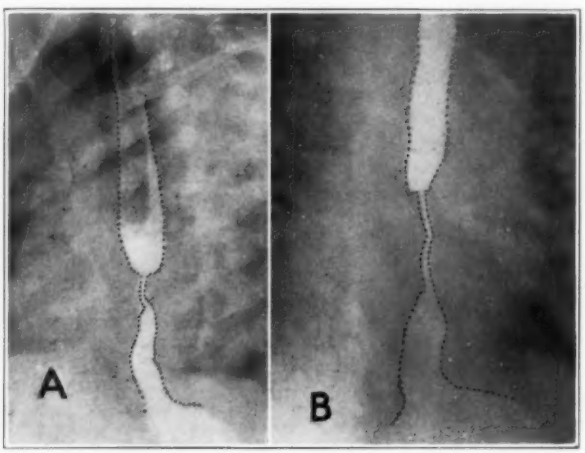

Fig. 2.—*A* is a roentgenogram of the esophagus of a boy of 5 years with symptoms of three years' duration. The spasm appears to be 2 inches above the diaphragm. The esophagoscopic examination revealed a typical picture of cardiospasm. All symptoms were relieved during treatment extending over eight years. *B* is a roentgenogram of the esophagus made nine years after the film shown in *A* was made. There were no symptoms. The dilatation is still apparent. The spasm is at the same level above the cardiac canal. Under the fluoroscope the spasm changed from the level shown in the roentgenogram to the diaphragmatic level and back again several times.

It has been stated frequently that cardiospasm is a psychoneurotic manifestation (fig. 2). It is a common clinical observation that cardiospasm may follow nervous shock and other hysterical conditions. However, as pointed out by Vinsen, not only the symptoms but the dilatation of the esophagus in these cases is much less than that in true cases of cardiospasm. Diffuse spasm of the lower end of the esophagus is more apt to be seen in the neurotic patient. Besides, cardiospasm usually occurs in the calm, well balanced patient with a normal nervous system.

The neurogenic cause of cardiospasm is the one most generally accepted by clinicians. By neurogenic is meant some disturbance of the nervous control of the cardiac sphincter. There is failure of the mechanism of coordination by means of which the sphincter is relaxed during swallowing. On this assumption a few cases have been reported in which bilateral cervicothoracic sympathetic ganglionectomy has been done to eliminate the predominant activity of the sympathetic nerves. Good results have been reported, but emphasis has always been placed on the relief from pain, which is only part of the picture. Dilatation of the esophagus occurs as a result of its distention by food which does not pass into the stomach. Hypertrophy of the muscular coat is always compensatory. Whether the condition is due to degeneration of the local nerves or to impulses from some other source which reflexly prevent

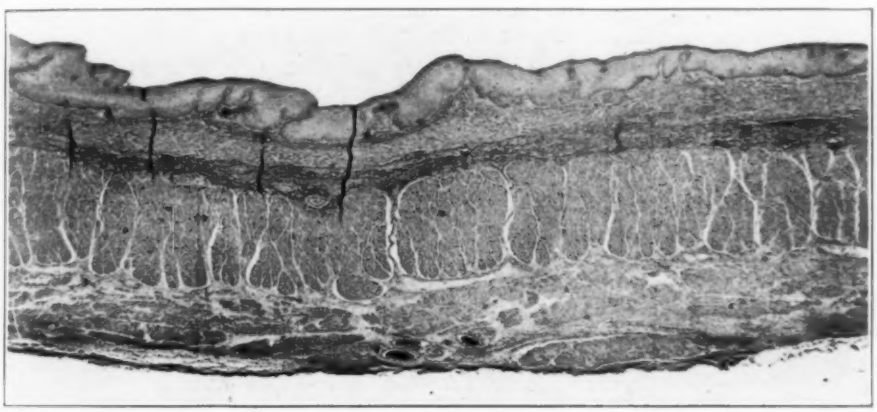

Fig. 3.—A microscopic section (× 8) of the esophagus of a child aged 15 months. The history is not known. The child died of perforation by a bougie. A definite stricture was found 1 cm. above the cardiac opening—the result of a healed, puckered scar. The wall was three times the normal size owing to hypertrophy.

relaxation of the cardia has not been determined. So far no one has been able to point out definite degeneration of the local nerves.

POSTMORTEM APPEARANCES

The postmortem observations in several cases have been described by Kelly and Moore. The most striking feature is the dilatation. The esophagus is increased not only in girth but in length (figs. 1 and 6 *A*). When the esophagus was opened the following changes were noted: ulceration of the membrane, to the extent of exposing the muscular layer; small white patches of epithelial proliferation or leukoplakia; sessile papillomas and fibrous or tubulous nodules. In the majority of

cases the wall of the esophagus has undergone thickening. The thickening varies not only in different cases but at different levels of the same case. Generally it is greatest in the lower and most distended part of the esophagus. The thickening of the wall is due to hypertrophy of the inner or circular muscle layer. The outer longitudinal layer is not hypertrophied. Hypertrophy of the fibers about the cardiac canal is rare. The normal adult esophageal wall is 1.5 mm. thick, but the hypertrophied wall may be increased to from 4 to 7 mm. Muscular atrophy rather than hypertrophy has been reported but is exceedingly rare. In cases of long standing there are likely to be fibrotic and degenerative changes, especially in the circular muscular coat. Other changes associated with cardiospasm occur in the length of the cardiac canal and in the width of the cardiac orifice. The cardiac canal may be normal in length and diameter, and all the dilatation may be above the diaphragm. This is the more serious type and the only one in which the patients die of starvation. On the other hand, the canal may be extremely short but abnormally wide, mere constriction marking the separation of the esophagus and the stomach.

Degeneration involving Auerbach's plexus has never been demonstrated beyond reasonable doubt.

REPORT OF CASES

CASE 1.—*History.*—A white woman, aged 62, entered the New Haven Hospital in 1925, complaining of persistent vomiting preceded and followed by pain below the sternum, difficulty in swallowing and loss of weight.

The family history was unimportant. The past history brought out the fact that the patient had a "nervous breakdown" at the menopause, twenty years previous to admission.

The present illness began about five years before admission. The initial symptoms were those of nausea and vomiting of one week's duration. Since the onset the patient had had such attacks occasionally, but the general health was good until seven months before admission. At that time a severe attack of vomiting incapacitated the patient for one week. On recovery she returned to her occupation of nursing and remained well for the next four months. Three months before admission severe attacks of vomiting began; these persisted until the time of admission. Associated with the vomiting the patient had had "colicky" epigastric pains. During the last six months she had lost about 20 pounds (9.1 Kg.). Constipation had been present for a number of years. The appetite had been poor. In the four months preceding admission the patient had vomited all solid foods immediately after the meal.

Examination.—On admission physical examination revealed a dehydrated and emaciated woman who complained of constant epigastric pain. The temperature, pulse and respiratory rate were normal. The blood pressure was 130 systolic and 85 diastolic. There was an acetone odor to the breath. There was a firm, freely movable, small mass, measuring 3 cm. in diameter, attached to the isthmus of the thyroid. The remainder of the examination gave negative results. The impression

from the examination was that the patient had carcinoma either of the stomach or of the esophagus.

The laboratory examination gave the following results: The red and white blood cell counts were normal. The gastric analysis revealed no free hydrochloric acid, and a combined acidity of 72; the presence of lactic acid, Oppler-Boas bacilli, starch and fat indicated gastric retention. The roentgen (fig. 4) and fluoroscopic examinations revealed marked dilatation of the entire esophagus with a small anterior pouching at the level of the fourth vertebra. The lower end of the esophagus was funnel-shaped, smooth and regular in outline. A small amount of barium passed into the stomach.

Esophagoscopic Examination: The larynx was examined first in view of the swelling of the thyroid isthmus. The vocal cords appeared normal and moved

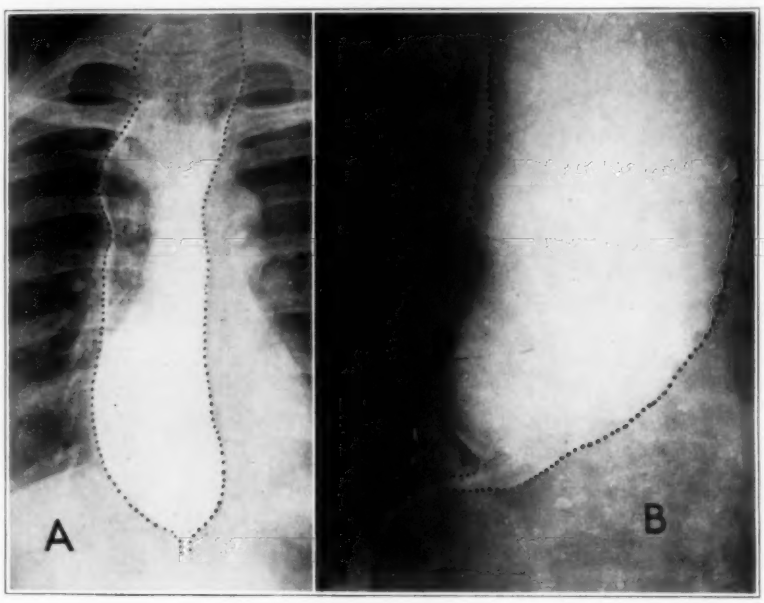

Fig. 4 (case 1).—*A* is a roentgenogram of the esophagus showing the marked dilatation and the typical funnel shape of the cardiospasm. *B* is a roentgenogram of the lower end of the esophagus showing the typical funnel shape at the diaphragmatic hiatus 2 cm. above the cardiac opening.

normally on phonation and deep respiration. Over the esophageal surface and extending into the pyriform sinus on the right was a whitish membrane which caused slight bleeding on removal (this was subsequently found to be an infection with Oidium albicans). With the passage of the esophagoscope it was seen that the whole esophagus was dilated. Its walls presented a grayish, pasty appearance indicative of esophagitis. While the spasm was evident at the hiatus, it was readily overcome, and it was not difficult to pass the esophagoscope into the stomach. At no place was the wall of the esophagus ulcerated or indurated. There was no evidence of stricture or of any web formation or gluing together of rugae. Cardiospasm was definitely established as the diagnosis.

Course.—During the next seven weeks the patient's condition remained stationary. The problem of feeding and giving sufficient fluids was difficult because of the persistent vomiting. A high caloric diet was given, but the food which was not immediately vomited was often found in the stomach washings on the following day. Feeding by Rehfuss tube was tried, but the tube caused ulceration

Fig. 5 (case 1).—A drawing showing hypertrophy of the muscular coat (*A*) and a normal esophagus (*B*).

of the esophageal epithelium and this was finally discontinued. The previous infection with Oidium cleared up. Although the diagnosis of cardiospasm seemed definitely established by means of the roentgen and esophagoscopic examination, an exploratory laparotomy was decided on following a consultation. The operation revealed no lesions in the lower end of the esophagus or in the stomach. A gastrostomy was performed. A finger was passed readily up through the cardia from the stomach. The patient stood the operation well, but there was considerable

difficulty in feeding through the gastrostomy tube. Signs of extensive pneumonia developed three days postoperatively, and death occurred four days later.

Autopsy.—The postmortem examination made by Dr. Richard C. Buckley disclosed an emaciated white woman who weighed 45 Kg. and measured 158 cm. in length. There was considerable sloughing of the tissues about the unhealed recent operative incision. There was gross and histologic evidence of bilateral extensive necrotizing pneumonia.

The stomach was contracted and contained about 50 cc. of foul-smelling, green, watery material. The lining mucosa was reddened, especially about the gastros-

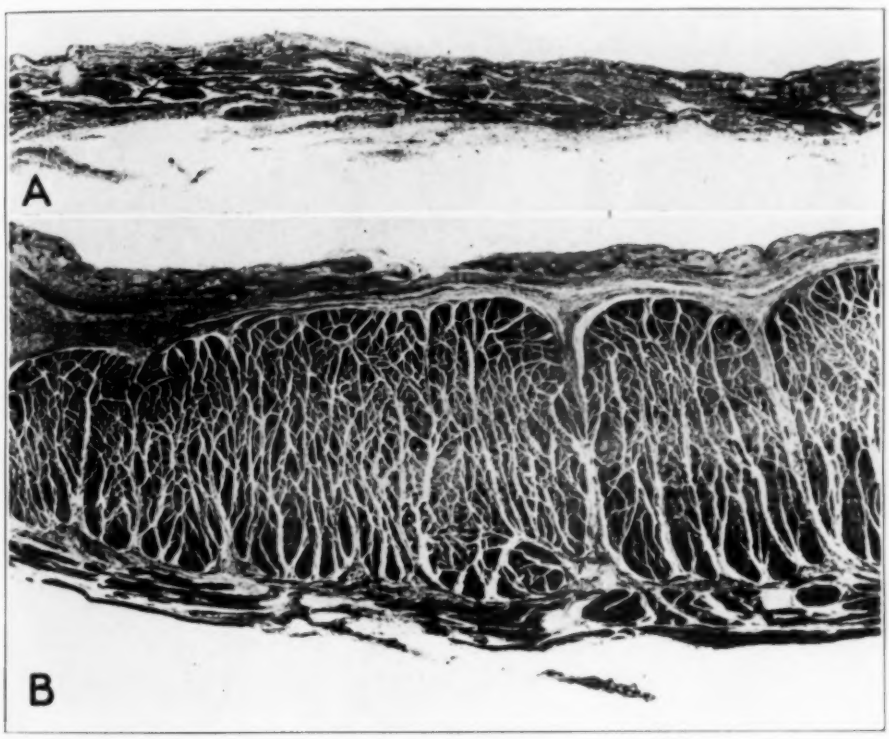

Fig. 6 (case 1).—*A* is a microscopic section (× 25) showing the wall of the esophagus at its upper end. There was no hypertrophy at this level. *B* is a microscopic section (× 25) showing hypertrophy of the circular muscle layer at the cardiac end of the esophagus.

tomy opening. The cardia of the stomach was 3 cm. in circumference. Above the cardia the esophagus was tremendously dilated (fig. 5). The average circumference of the lower two-thirds was 9 cm. The upper third was more widely dilated by the outpocketings, so that the circumference was about 11 cm. One and five-tenths centimeters from the stomach the esophagus abruptly narrowed to from 2 to 2.5 cm. in circumference. The approximate length of the esophagus was 24 cm. The thickness of the wall varied. In the upper third it measured 2 to 3 mm. (fig. 6 *A*). It then increased in thickness so that the middle and greater portion

of the lower third averaged 1 cm. (fig. 6*B*). At the cardia it thinned to about 2 mm. The increase in thickness was due entirely to an enormous increase in the circular muscle of the middle and lower thirds. The circular muscle was only slightly thickened in the upper third. The mucosa of the upper third was pearl white, shining and intact. It resembled cornified epithelium. The mucosa of the lower two-thirds was swollen, reddened and covered in places with a necrotic gray membrane. There were a number of small superficial ulcers.

A longitudinal section of the esophagus was made, and the material was sectioned and stained with hematoxylin and eosin, Gram's stain and methylene blue. No organisms resembling those found in thrush were seen. The epithelium in the upper third was intact. There were congestion, edema and a diffuse infiltration of small round cells and plasma cells into the submucosa and muscular and adventitial coats. In the sections of the lower part of the esophagus the congestion,

Fig. 7 (case 1).—A microscopic section (× 200) showing regeneration of the epithelium and chronic inflammation of the submucosa.

edema and cellular reaction became more pronounced. The greater part of the reaction was in the submucosa. There was no evidence of necrosis of the muscle fibers. The epithelium of the lower portion was often superficially ulcerated and replaced by a membrane of fibrin plus cell débris. Evidence of regenerated epithelium was seen (fig. 7). The individual fibers of the circular muscle of this lower part were hypertrophied. Comparisons of the structure of the circular muscle with sections taken from the same areas in a number of other cases showed that this muscle was on an average about seven times as thick as normal muscle. The lower and middle thirds of this muscle averaged from 7 to 8 mm. in thickness. The longitudinal muscle was of about the same thickness as that in other cases in which there was no apparent abnormality of the esophagus. There was no increase in the muscle bundles of the cardia, nor was there any evidence of infection there. An examination of the nerve supply of the esophagus was made by

different stains, but there was so much element of doubt that no conclusions could be drawn from the observations.

CASE 2.—*History.*—A white woman, aged 57, was admitted to the New Haven Hospital in 1925 complaining that at times she was unable to swallow anything but liquids, although at other times she could swallow solid food. At times there were regurgitation and some substernal pain, and there had been marked loss of weight.

The family history was unimportant. The past history was irrelevant except for an operation for the removal of a fibroid tumor five years previously.

The present illness began about four years before admission with gradually developing difficulty in swallowing. Food did not go down readily and caused pain behind the sternum. About one year later the patient began to have frequent attacks of vomiting which occurred a half hour or less after eating. A fluoroscopic examination made one year before admission revealed a dilated esophagus with closure at the cardia. The esophagus was dilated by means of the largest esophageal dilator guided by a swallowed thread. Several gastric lavages were made after that with considerable relief. For the preceding three months the patient had been vomiting a large part of everything she swallowed, including water. She had lost 73 pounds (33.1 Kg.) in the last two years.

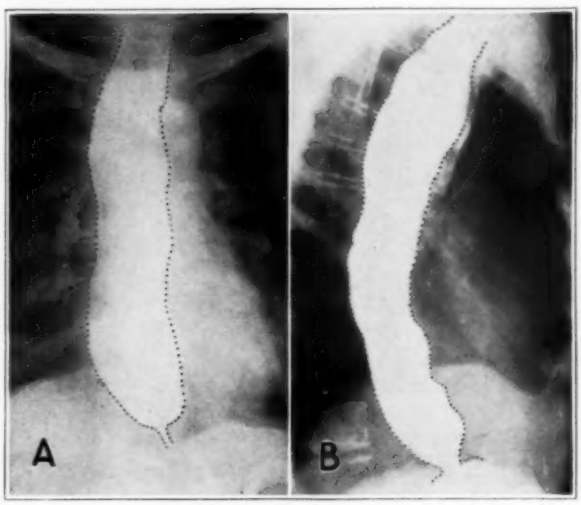

Fig. 8 (case 2).—*A* is a roentgenogram of the esophagus. The dilatation was not as marked as in case 1 but presented the typical picture of cardiospasm. *B* is a roentgenogram made eight years after that shown in *A*. Apparently there was little change after prolonged but inefficient treatment.

Examination.—On admission the physical examination revealed a well developed middle-aged woman who was markedly emaciated and dehydrated. The temperature, pulse and respirations were normal. The blood pressure was 112 systolic and 66 diastolic. The heart, lungs and abdomen were normal except for the laparotomy scar in the abdomen. The impression was that the patient had cardiospasm of the esophagus.

The laboratory examination gave the following results: The blood count was normal. A gastric analysis was not done. The roentgenographic (fig. 8 *A*) and

fluoroscopic examination revealed marked dilatation (from 4 to 5 cm. in the transverse diameter) throughout the esophagus. The lower end of the esophagus was funnel-shaped, smooth and regular in outline. A small amount of barium passed through the narrow cardiac portion of the esophagus into the stomach.

Esophagoscopic Examination: I made this examination. It revealed marked dilatation of the entire esophagus. The lining membrane was rather pale and pasty. There was definite spasm in the hiatal portion of the esophagus, which was easily overcome, so that the esophagoscope passed readily into the stomach. No ulceration, strictures or web formation at the cardia were noted.

Course.—The patient was readmitted to the hospital eight years later. For five years following her discharge she underwent dilation weekly with esophageal bougies. She got along very well and had vomiting attacks only when she was tired or nervous or had a cold. She stopped the treatments because she grew tired of them and felt that she was well enough to get along without them. Six months before the second admission she began to have a dry, hacking cough which continued until admission. During the same interval she felt steadily worse. The vomiting and regurgitation became worse. There had been a change in symptoms in that she had been vomiting sour, foul food which apparently had been eaten twelve hours previously.

The physical examination at this time revealed much the same condition as was noted before, but that there were edema of the ankles, generalized arteriosclerosis and a mild degree of auricular fibrillation. The laboratory examination gave negative results. The roentgen examination (fig. 8 *B*) revealed a condition similar to that noted before. On the day after admission the temperature rose to 101 F. owing to a slight cold, but this subsided within twenty-four hours.

An esophagoscopic examination was attempted four days after the subsidence of the fever. In overcoming the resistance of the cricopharyngeus muscle an apparent split in the mucous membrane was noted and further manipulation was discontinued. Following this there developed swelling and soreness of the lower anterior portion of the neck but no fever. After one week the temperature suddenly rose to 102 F. Bronchopneumonia involving both lungs developed, and the patient died within two days.

Autopsy.—The postmortem examination, which was performed by Dr. D. W. Gaiser, revealed an emaciated white woman weighing 40 Kg. and measuring 158 cm. in length. There was gross and histologic evidence of periesophagitis, mediastinitis, confluent focal pneumonia (bilateral), hydrothorax (bilateral), hydropericardium, passive congestion of the liver and healed aortic endocarditis. The inflammatory lesions were probably the result of perforation of the esophagus.

The stomach was moderately enlarged and contained about 500 cc. of foul-smelling, green, watery material. The lining mucosa was light grayish pink, except for a few bright red areas due to blood beneath the serosa. The cardiac opening was 3.5 cm. in circumference.

The esophagus was markedly dilated (fig. 9) beginning about 5 cm. below its origin and ending at the cardiac canal. This dilatation was uniformly 13 cm. in circumference throughout. The cardiac canal was 2 cm. long. The wall of the esophagus was definitely thickened throughout the dilated portion and was 3 mm. in thickness. The mucous membrane had numerous raised white plaques (leukoplakia) interspersed with areas in which the membrane was denuded, leaving a pale greenish-yellow surface. There was a defect in the mucous membrane 3 mm. in diameter which communicated with a large abscess cavity in the mediastinum (due to perforation by the esophagoscope). There were no unusual kinks or thickenings of the esophagus as it passed through the diaphragm.

Microscopically there were numerous areas in which the epithelium was entirely gone and other areas in which it had piled up many layers in thickness and showed a tendency to form epithelial whorls. The tunica propria was thickened by fibrous tissue which was densely infiltrated by small round cells. Many dilated lymphatics filled with polymorphonuclear leukocytes were seen near the surface. The fibromuscular layers showed an increase in the size of the individual bundles,

Fig. 9 (case 2).—The esophagus after it was opened. The hypertrophy was not as marked as in case 1 owing to extensive fibrosis of the muscular coat. The pronounced irregular hypertrophy of the mucosa (leukoplakia) is evident.

but this increase was evident only in the circular layer. A Mallory connective tissue stain showed the enlarged circular muscle bundles to consist almost entirely of fibrous tissue. In the circular muscle bundles subjacent to the beginning of the gastric mucosa there was a fibromuscular bundle which was distinctly larger than the others but not as large as many seen in the midportion of the esophagus. No stains were made to show nerve degeneration.

COMMENT

The first patient presented a typical picture of cardiospasm, which was verified by fluoroscopic and esophagoscopic examinations and by operation.

The pathologic reports on cases similar to this are few because death is not common in such conditions. The consensus seems to be that there is dilatation with muscular hypertrophy of the walls without hypertrophy of the cardiac sphincter. Some observers have expressed the belief that the lesion is caused partly by esophagitis.

The observations on this case presented some interesting facts. There was a tremendous increase in the size of the circular smooth muscle of the lower two thirds of the esophagus with no increase in the size of the longitudinal muscle bundle. The circular muscle of the upper third was thickened only slightly and only in its lower portion, where the smooth muscle predominated. There was an extensive and diffuse chronic inflammatory reaction involving all coats but especially the submucosa. There was no evidence of hypertrophy of the muscle fibers at the cardia, and the infection was much less evident in this portion.

The following opinion, written by Dr. Buckley ten years ago, is mentioned in view of the opinions expressed by Mosher in 1933:

> One hesitates to add other opinions as to the etiology of cardiospasm, but this case presented a chronic inflammatory reaction with a dilatation of the lumen and hypertrophy of the walls which can be compared to similar lesions elsewhere—notably the genito-urinary tract. There is a group of cases of dilatation of the ureters which can be explained on infection alone, as one finds no point of obstruction. No obstruction of the esophagus was present but there was abundant evidence of infection.

The second patient, who died as a result of trauma following an esophagoscopy showed a picture of much longer standing. There was pronounced leukoplakia of the mucosa, as was readily seen macroscopically. There was ulceration of the mucous membrane with much more inflammatory reaction than in the first case. The hypertrophy was not so marked owing to extensive fibrotic change of the muscular fibers.

Continued closure of the cardiac orifice might be due either to inhibition of contraction of the longitudinal muscular coat or to spasm of the circular coat. Hypertrophy would not result from simple dilatation but would result from some functional obstruction. If obstruction were spasmodic, hypertrophy of the muscular fibers forming the cardiac sphincter would be expected, but this is rarely seen. Hence it is necessary to fall back on the theory of failure of the coordinating mechanism by which the cardiac sphincter is relaxed during swallowing. Acute and chronic inflammatory reactions have been the outstanding observations in the majority of postmortem examinations. Mosher, in his recent publi-

cation, said that he had demonstrated that cardiospasm was due to fibrosis of the terminal portion of the esophagus caused by infection from contiguous organs. A study of the two cases reported here would confirm the observation that a chronic inflammatory reaction in the terminal portion of the esophagus was the cause of the cardiospasm. There was no evidence in either case that there was or ever had been any intra-abdominal infection to account for it. It was impossible to rule out a definite neurogenic origin. However, these two autopsies and most of the other autopsies reported have shown chronic inflammatory changes in the esophagus which in themselves readily account for the development of the condition known as cardiospasm.

BIBLIOGRAPHY

Bull, P. N.: So-Called Idiopathic Dilatation of the Esophagus, Ann. Surg. **81**:59, 1925.

Guns, P.: Phrenospasm and Cardiospasm in Mega-Esophagus, Arch. Otolaryng. **8**:156 (Aug.) 1928.

Hertz, A. F.: Achalasia of the Cardia, Quart. J. Med. **8**:300, 1915.

Jackson, C.: The Diaphragmatic Pinchcock in So-Called Cardiospasm, Laryngoscope **32**:139, 1922.

Kelly, A. B.: Discussion on Diseases of the Esophagus, Brit. M. J. **2**:471, 1922.

Nervous Affections of the Esophagus, J. Laryng. & Otol. **42**:221, 1927.

MacKenzie, M.: Diseases of the Throat and Nose, New York, William Wood & Company, 1884, vol. 11, pp. 114 and 207.

Mikulicz, J.: Zur Pathologie und Therapie des Cardiospasmus, Deutsche med. Wchnschr. **30**:17 and 50, 1904.

Moersch, H. J., and Camp, J. D.: Diffuse Spasm of the Lower Part of the Esophagus, Ann. Otol., Rhin. & Laryng. **43**:1165, 1934.

Moore, I.: The Pathology of Esophagectasia, J. Laryng. & Otol. **42**:577, 1927.

Mosher, H. P.: Liver Tunnel and Cardiospasm, Laryngoscope **32**:348, 1922.

The Lower End of the Esophagus at Birth and in the Adult, J. Laryng. & Otol. **45**:161, 1930.

Involvement of the Esophagus in Acute and Chronic Infection, Arch. Otolaryng. **18**:563 (Nov.) 1933.

Plummer, H. S., and Vinsen, P. P.: Cardiospasm, M. Clin. North America **5**:355, 1921.

Rolleston, H. D.: Simple Dilatation of the Esophagus, Tr. Path. Soc. London **47**:37, 1896.

SARCOMA OF THE LARYNX

REPORT OF TWO CASES

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ROCHESTER, MINN.

Sarcoma of the larynx is rarely observed. Since 1910 only 6 patients with sarcoma of the larynx have been seen at the Mayo Clinic as compared with more than 800 patients with carcinoma of the larynx. In 1933 Figi [1] reported 4 cases and thoroughly reviewed the literature.

During the last year (1934) I operated on the two patients with sarcoma of the larynx whose cases I am reporting. Like cases of malignant tumor in the antrum of Highmore and in the pharynx, cases of sarcoma are not reported as frequently as they were a decade or two ago, apparently because the pathologists believe that many of these tumors are epithelial rather than mesodermic in origin.

REPORT OF CASES

CASE 1.—A man aged 51 came to the clinic on Oct. 8, 1934, on account of hoarseness which came on suddenly, eight weeks before, following an attack of infection of the upper part of the respiratory tract. He had not had hoarseness, sore throat or any generalized illness previously. The hoarseness had been progressive since the onset. There had been no dysphagia or dyspnea.

Examination revealed a tumor, 1 cm. in diameter, attached to the anterior third of the left vocal cord. The tumor was reddish, ulcerated and covered with exudate. Its appearance was that of a highly malignant tumor. The anterior commissure apparently was not involved. General examination at that time disclosed nothing of note. A roentgenogram of the patient's chest revealed no abnormality, and the Wassermann test of the blood was negative.

The patient did not remain for treatment. He returned in a week, however, and at that time the tumor appeared to be much larger. It was thought best to perform preliminary tracheotomy, to be followed later by thyrotomy. Tracheotomy was performed on Oct. 17, 1934, and specimens for biopsy, which were removed through the tracheotomy wound, revealed an infected fibromyxosarcoma, grade 4. Considerable reaction with tracheitis developed following the operation, so it was about a month before thyrotomy could be undertaken. During that time the tumor increased a great deal in size.

On Nov. 22, 1934, thyrotomy was performed under paravertebral block anesthesia and a tumor was found completely filling the larynx and extending into the subglottic region. The tumor measured 5 by 2 by 3 cm.; its surface was smooth, with a tendency to be nodular, and there was some ulceration in its upper portion. It was found to be attached by a small pedicle to the anterior two thirds of the left vocal cord (fig. 1). The tumor was removed, and the base was destroyed with

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From the Section on Laryngology, Oral and Plastic Surgery, the Mayo Clinic.

1. Figi, F. A.: Sarcoma of the Larynx, Arch. Otolaryng. **18**:21 (July) 1933.

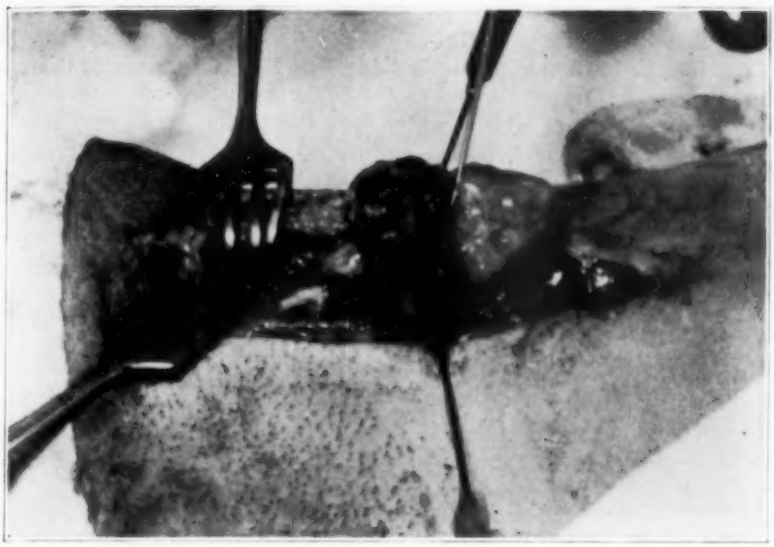

Fig. 1 (case 1).—Photograph of the tumor at operation. The chin is to the left. The rake retractors are separating the divided hyoid bone. The tracheotomy opening may be noted in the lower end of the incision. The large tumor, which is attached to the anterior portion of the left vocal cord, is being held up by a hook through the thyrotomy opening.

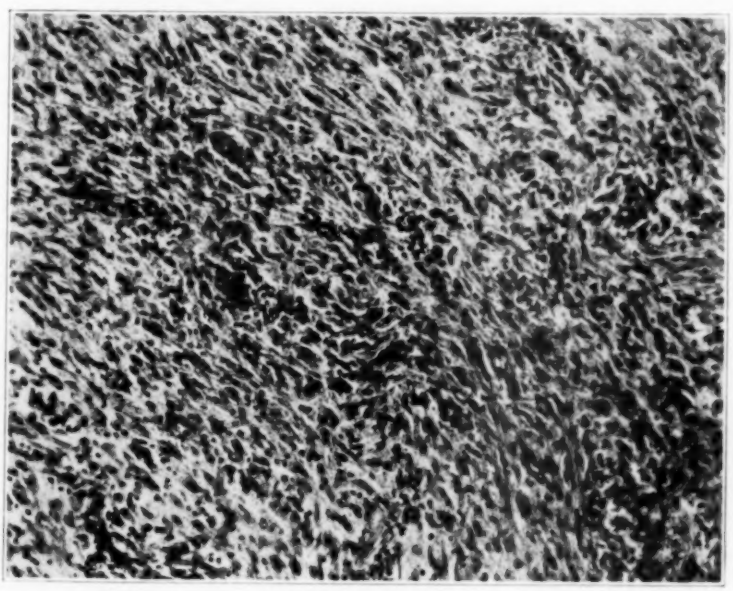

Fig. 2 (case 1).—Photomicrograph of a section of the fibromyxosarcoma, grade 4.

diathermy. The wound was closed in the usual manner with catgut, a split rubber tube being used outside the thyroid cartilage. Microscopically the tumor was found to be a fibromyxosarcoma, grade 4 (fig. 2). The patient made an uneventful recovery. He was given postoperative roentgen treatment and was dismissed Dec. 11, 1934.

CASE 2.—A woman aged 56 came to the clinic on Feb. 8, 1934, on account of difficulty in breathing. She had been using two or three pillows at night for the past few months. She stated that she had an attack of influenza about a year before. After that she was bothered by what she thought was a goiter and she had been much more troubled in the last two or three months. Her appetite had

Fig. 3 (case 2).—Roentgenogram showing the shading of the upper part of the trachea and larynx caused by the tumor.

been good, but she had lost 10 pounds (4.5 Kg.) in a year. She had no general complaints other than that of increasing dyspnea.

Examination revealed a tumor below the vocal cords, apparently attached to the left and posterior walls of the larynx and trachea. It almost completely filled the subglottic space so that there was only a small portion in the anterior commissure below the cords which it did not occupy. There was dyspnea of about grade 3. The vocal cords moved normally except that there was slight mechanical interference from the tumor. There was no ulceration, and the surface of the tumor was smooth, suggesting a chondroma.

A general examination disclosed nothing of note. The roentgenogram of the larynx revealed a large, rounded, soft tissue tumor on the posterior wall of the larynx and trachea (fig. 3). On account of the marked dyspnea, tracheotomy was

Fig. 4.—Drawing showing the extent of the chondrosarcoma in case 2. It extended from the subglottic region to the fourth tracheal ring and completely filled the trachea when it was closed.

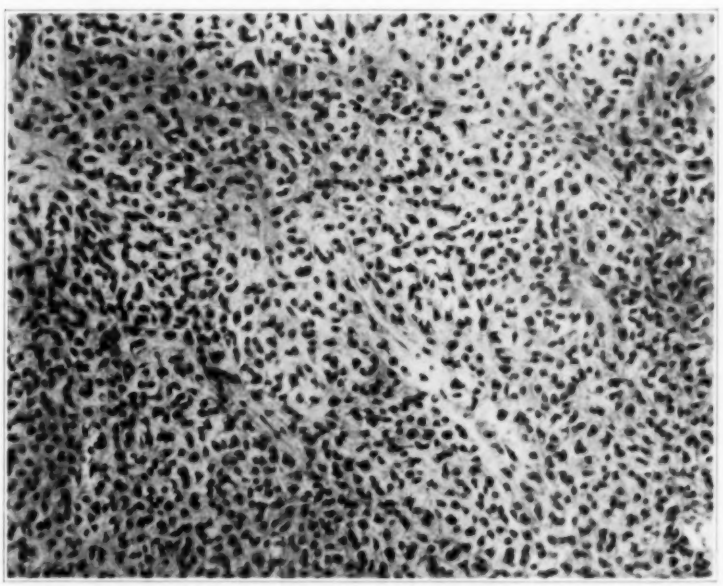

Fig. 5 (case 2).—Photomicrograph of a section of the chondrosarcoma, grade 1.

advised. It was thought that the type of the tumor could be determined after the patient had fully recovered from the tracheotomy and that an exploration of the larynx could be made then if necessary.

On Feb. 10, 1934, under local infiltration anesthesia, tracheotomy was made below the isthmus of the thyroid gland, in the region of the fifth tracheal ring. A specimen of the tumor for biopsy was obtained through the opening made by the tracheotomy, and it proved to be a chondrosarcoma, grade 1. The patient had an uneventful convalescence following the tracheotomy, and on February 27 thyrotomy was performed, with exploration of the larynx and trachea. An extensive tumor, measuring 6.5 by 4 by 3 cm., was found, which almost entirely filled the larynx and upper portion of the trachea (fig. 4). An incision was made over the tumor, and an attempt was made to remove it in its capsule, but as this was impossible, the granular material was removed with a curet. Microscopically the tumor proved to be a chondrosarcoma, grade 1 (fig. 5). After the tumor had been removed piecemeal the incision was closed with catgut. The patient made an uneventful convalescence. She received postoperative roentgen therapy over the neck. The tracheotomy tube was removed and she was dismissed on April 13, 1934.

COMMENT

The treatment of sarcoma of the larynx must depend on the situation of the growth, its method of attachment, its type of growth and its activity. It may vary from a fibrosarcoma of grade 1, which is an inactive type, to a fulminating type of sarcoma. It may be pedunculated although of active growth, as in case 1; or it may be diffuse although an inactive malignant growth, as in case 2. The sarcomas of the larynx that have been seen at the clinic have been either of low grade or encapsulated, so that they have been removed by means of thyrotomy followed by the use of surgical diathermy and irradiation. I have seen in young adults highly malignant laryngeal tumors with diffuse involvement that have been reported as squamous cell epitheliomas, grade 4, but have proved to be rapidly growing tumors acting clinically like sarcomas. In these cases irradiation has been employed rather than any surgical procedure. Under this treatment the tumors temporarily disappear entirely, but I have never seen a patient who has had such a tumor and who has remained well. In the cases of more extensive laryngeal tumor in which thyrotomy is to be performed I feel that a two stage operation is advisable. Preliminary tracheotomy is performed, and then after the patient has convalesced exploration of the larynx is carried out by means of thyrotomy. More extensive tumors should be removed by laryngectomy. The prognosis in cases of sarcoma of the larynx, because of the large percentage of low grade tumors of mesodermic origin, is, in general, better than in cases of epithelioma. In the cases that have been reported enough time has not elapsed since operation to warrant a report as to the outcome, although at the time the patients were last heard from there had been no recurrence.

NASAL AND BRONCHIAL ALLERGY IN CHILDHOOD

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The frequency of nasal and bronchial allergy in childhood needs constant emphasis in the minds of all physicians. Pediatricians have long realized this fact since the epochal work of O. M. Schloss,[1] who was the first to demonstrate the clinical value of the skin reaction, and whose other contributions on allergy in childhood up to 1920 laid the basis of much of the present knowledge of this subject.

Of general interest is the realization that the statistics on the frequency of allergy in the general population must be changed. Thus, my analysis carried out on two thousand students at the University of California showed a personal history of allergy in 33 per cent and a family history of allergy in 35 per cent. When Vaughan [2] included migraine, gastrointestinal allergy and food idiosyncrasies with urticaria, eczema, hay fever and asthma, he found evidence of personal allergy in 60 per cent of the total population in a small community of five hundred and eight persons. Some pediatricians believe that most children show some minor or major allergic manifestations sooner or later, and Vaughan and I conclude that this is also true of adults.

Pediatricians and rhinologists are constantly forced to decide whether sensitization or infection is responsible for acute and chronic rhinitis, sinusitis, tracheitis, laryngitis and bronchitis. Typical acute rhinitis and paranasal sinusitis, with hyperemic membranes and mucopurulent secretions, malaise and fever, are invariably due to infection. Recurrent acute involvements or chronic congestions with or without evidences of definite infection may be primarily allergic in origin. In favor of allergy is the definite presence of the condition in question in the personal or family history. The pale, edematous nasal mucous membrane with abundant mucoid secretion is present during the activity of allergy but may be absent in the quiescent periods. Of special diagnostic value is the microscopic examination of the nasal and bronchial secretions for eosinophils. The eosinophilic infiltration in allergic bronchial and nasal mucous membranes accounts for the presence of such cells in the secre-

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Read by invitation before the western division of the American Academy of Pediatrics, Oct. 29, 1934.

1. Schloss, O. M.: Allergy in Infants and Children, Am. J. Dis. Child. **19**: 433 (June) 1920.

2. Vaughan, W. T.: Minor Allergy: Its Distribution, Clinical Aspects and Significance, J. Allergy **5**:184, 1934.

tions. The technic of such study was detailed in recent articles, especially by Hansel.[3] Watery secretions at times are devoid of eosinophils, which necessitates several other examinations before negative findings can be accepted. The predominance of eosinophils over polymorphonuclear cells points to allergy. The opposite findings favor infection. When eosinophils are at all numerous, allergy must be considered. Surgical therapy for such patients should be delayed until the allergy is under satisfactory control. Then previous indications for possible surgical intervention may disappear.

Nasal and bronchial allergy are often treated as though the cause were infection. Initial attacks of asthma are often misdiagnosed as bronchopneumonia. Nasal allergy may occur in cyclic attacks that resemble typical colds in the head. Moreover, such symptoms so frequently precede attacks of asthma that the opinion that asthma results from colds in the head is common. In part, this favoring of infection is due to the leukocytosis which is often found in the allergic child and which may occur in adults. The differential count helps in the exclusion of infection as a cause because of the increase in eosinophils and the comparatively slight elevation in the percentage of the polymorphonuclear cells. Fever may accompany recurrent attacks of asthma, nasal allergy, bilious attacks and especially cyclic vomiting and other acute gastro-intestinal allergies and suggest infection. I have long emphasized the importance of considering allergy as a common cause of obscure fever, especially in childhood. Thus, a boy of 11 years, who has been under my care for two years, had had attacks of cyclic vomiting associated with nasal congestion and a temperature of from 102 to 103 F. with constant fatigue and anorexia for four years. With proper elimination diets all these manifestations of allergy have been entirely absent. Finally, x-ray films of the sinuses in nasal allergy may reveal cloudiness, opacity and swelling of the mucous membrane similar to that resulting from known infection. The roentgenologist should report only variations from the normal and leave the determination of the underlying etiology to the patient's physician. As has already been stated, acute or chronic allergic reactions in the nasal and bronchial tissues, with the associated edema, often predispose to secondary acute or chronic infection. If such infection receives primary or sole therapy, the symptoms persist; the uncontrolled allergy intensifies the pathologic condition of the mucous membrane, and infection is extended. A patient with this condition is prone to repeated attacks of otitis media, tonsillitis, pharyngitis, sinusitis, bronchitis and even pneumonia. With successful control of the underlying allergy susceptibility to these infections diminishes.

3. Hansel, F. K.: Observations on the Cytology of the Secretions in Allergy, J. Allergy **5**:357, 1934.

BRONCHIAL ASTHMA

Bronchial asthma which develops before the age of 2 years usually is due to food allergy. However, I have many patients with food asthma which developed after 50 or even 60 years of age. In childhood, asthma due to food allergy is usually cyclic and nonseasonal. The attacks often become more frequent and less dramatic, and finally chronic asthma with occasional mild exacerbations may be established. Food asthma is usually relieved in high or dry regions and recurs in a day or two on return to the bay or ocean. Such temporary relief of food allergy may be due to variations in the atmospheric pressure, ultraviolet irradiation, or humidity, though it is uncertain whether any one of these plays the fundamental rôle.

Bronchial asthma due to inhalant allergens usually begins after the age of 2, although I have seen cases in which asthma due to pollen and animal emanations began during the first year. It is apt to be cyclic, although the spells usually occur at irregular intervals or are persistent and can be traced to exposure to some dust or animal emanation or to certain air-borne pollens. Such inhalant allergy may coexist with food allergy in the etiology of the asthma. Changes in location to escape contact with pollens, animal emanations or other causative inhalants give relief. This may explain the benefit of residence in a high or dry region. Moreover, in high altitudes the winds, the sparse vegetation and the lighter air may aid these inhalant-sensitive patients. The dry air also reduces moisture and the ability of the mucous membranes to extract the allergen from the inhalant substance alighting thereon. One patient, who was sensitive to horse dander, could ride at the head of a procession of horses for long distances, with little resultant asthma, at a boy's school at an elevation of 8,500 feet (2,590.8 meters). In the bay region he could not approach a horse without suffering from severe persistent asthma for several days after.

The cyclic recurrence of bronchial asthma and especially of that caused by food is probably due to the desensitization or the temporary exhaustion of the reactivity of the sensitized cells in the bronchial shock tissues. However, relief from food allergy may occur in certain patients by the vomiting and enforced fasting during the spell. When food is again taken the attack recurs in a few days or a few weeks, according to the amount of natural tolerance the patient has for the allergenic foods.

The theory that bacterial allergy is a cause of bronchial asthma in childhood has received little substantiation by allergists. It can frequently by hypothecated as a secondary allergy superimposed on ingestant or inhalant sensitizations, but this is difficult to prove. Both autogenous and stock vaccines probably owe much, if not all, of their benefit to

nonspecific protein effects or to heightening of bacterial immunity. My impression is that infection, when present, usually produces harm not through allergic reactions but through actual invasion of tissue and consequent production of toxin. Moreover, enlargement of the bronchial glands resulting from infection in the tonsils or sinuses may exaggerate and perpetuate coughing and wheezing primarily due to allergy. The bronchospastic action of bacterial toxins has not been proved in children. In adults bacterial sensitization apparently is a more frequent cause of bronchial asthma, especially in intractable and long-standing cases, than in children, but even in adult life it often is secondary to the usual ingestant or inhalant allergies, having assumed dominant importance as the asthma remained uncontrolled. Bronchial asthma due to drugs has not been reported in children, to my knowledge.

ALLERGIC BRONCHITIS

A dry irritative type of cough accompanied by little or no evidence of asthma is frequently due to allergy, as has been emphasized by Colmes and Rackemann, Kahn, Waldbott, and myself.[4] Such bronchitis may occur in cyclic attacks but usually becomes chronic. When due to food allergy, it is nonseasonal, though it is somewhat improved by the beneficial effect that summer invariably has on food sensitizations. Patients with allergic bronchitis may evidence no other manifestation of allergy, though nasal symptoms usually are present. The finding of eosinophils in the secretions constitutes important evidence in favor of allergy. Urticaria in the bronchi as a cause of attacks of an allergic cough is possible in children, but I have not noted it as I have in certain adults. Likewise, the occurrence of angioneurotic edema in the larynx, bronchi or even in the parenchyma of the lungs, as described by Cole and Korns [5] and observed in one of my patients, has not been recorded in children.

POLLEN HAY FEVER

Nasal congestion and discharge due to pollen can usually be suspected by their seasonable occurrence. In California pollen may produce perennial symptoms, however, especially if the patient is sensitive to flower pollens. Itching and sneezing are usually prominent symptoms, although these may be absent. Allergic conjunctivitis with only slight nasal manifestations may occur; or pharyngeal, postnasal or sinusal congestion without typical symptoms of hay fever may predominate. In

4. Rowe, A. H.: Food Allergy: Its Manifestations, Diagnosis and Treatment, Philadelphia, Lea & Febiger, 1931.

5. Cole, J., and Korns, H. M.: Visceral Manifestations of Angioneurotic Edema; Report of a Case with Recurrent Pulmonary Involvement, J. Allergy **5**:347, 1934.

obscure cases examination of the nasal secretions for eosinophils is a valuable diagnostic adjunct. It must be remembered that patients with mild or marked pollen hay fever may also have sensitivity to foods or inhalants. The recognition of these other sensitizations is most important for successful therapy and emphasizes the necessity of experienced and complete testing with food as well as inhalant allergens and an analysis of the patient's complete history from the point of view of sensitizations other than pollen.

PERENNIAL HAY FEVER

Perennial hay fever is especially frequent in childhood. The characteristic sneezing, nasal congestion and occlusion and the watery or mucoid discharge may recur in attacks or may be constant, with little seasonal variation. Allergic bronchitis or asthma may or may not be present. Dr. Clifford Sweet has noted the frequent redness of the conjunctiva, especially on the nasal side, in this condition, as well as in other allergic conditions. The allergic reaction involves not only the mucous membranes of the nasal passages, but also those of the paranasal sinuses, which increases the discomfort tremendously. Itching of the nose is usually absent when food allergy is the sole cause, being prominent though not necessarily present when inhalants are operative. As in bronchial asthma, food, pollen, animal emanations, orris, pyrethrum, dust and other miscellaneous allergens may individually or concomitantly produce perennial hay fever. In my experience, food allergy, not evidenced by skin tests and ascertained through elimination diets, has been a frequent cause of this condition. The nasal congestion and blocking lead to uncontrollable clearing of the throat and nasopharynx, rubbing and picking the nose and snoring and noisy breathing which disturb the sleep of the patient and parents alike. The exaggeration of the symptoms with exposure to drafts or changes of temperature, on awakening and during the first hours of the morning is impossible to explain accurately, though the accepted cause is reflex vasomotor stimulation of the nasal membranes.

ASSOCIATED ALLERGIC DISTURBANCES

In emphasizing the nasal and bronchial allergies in childhood one must not disregard the frequency of other common manifestations or minimize the importance of less frequent disturbances due to various allergic causes. Symptoms in all parts of the gastro-intestinal tract,[6] from the mouth to the anus, arising from food allergy, are known to

6. Rowe, A. H.: Gastro-Intestinal Allergy, J. A. M. A. **97**:1440 (Nov. 14) 1931.

all. Abdominal pain and cramping not uncommonly accompany nasal and bronchial allergy. Anorexia, dislike for foods, difficulties in feeding and regurgitation and gagging during eating due to food allergies often afflict these patients. Urticaria, localized and generalized edema and eczema may complicate the problem. Toxemia due to food, which I have described, and also to pollen, as reported by Kahn, must be recognized. Continued high or low temperature, cyclic vomiting and bilious attacks with or without headache, usually predicting the eventual establishment of migraine after puberty, are often due to food allergy. Ocular allergy arising from foods and inhalants and bladder allergy are receiving more notice. These protean possibilities of inhalant, ingestant and, to a lesser extent, bacterial allergy, must be realized in treating a patient whose condition may be bronchial or nasal allergy.

DIAGNOSIS

In the diagnosis of the specific allergies a carefully taken family and personal history are of outstanding importance. Food allergy is indicated by a history of migraine, bilious attacks or any of the recognized gastro-intestinal manifestations of food allergy; by asthma that begins in the first year or two of life; by urticaria or angioneurotic edema, and by a history of eczema in infancy. The evidence pointing toward pollen, dust, animal emanation, orris and other miscellaneous inhalant allergies is generally known.

Probably there are few persons who fail to reveal the presence of some allergic manifestation in their personal, and especially in their family, history. The degree to which such histories reveal allergic conditions constitutes the important evidence in the analysis. I am convinced that the tendency to the development of specific types of allergy, be it to pollen or food, and not infrequently to individual allergens themselves, may be inherited. Egg, milk, fruit, fish and cereal allergies have been noted in succeeding generations in many of my patients.

Skin tests and the expertly taken history are of equal importance, although it must be appreciated that without skin tests the present knowledge of allergy and the refinements possible in diagnosis would have been impossible.

I agree with Coca that the scratch test carefully performed with dependable food allergens will usually yield the available information concerning the presence of bodies sensitizing the skin to the foods productive of allergy. The additional reactions obtainable with intradermal testing with extracts made in my own laboratories and from several private and commercial sources have been of little help, and the many questionable, slight and positive reactions obtained have usually

added confusion in the determination of clinical food sensitizations. These reactions not accompanying clinical allergy may be due to nonspecific histamine-like substances in the extracts or released in the skin as a result of the trauma of the test, as was pointed out by Smyth and Bain, or to potential sensitizations that are of no clinical significance.

It must be emphasized, moreover, that all positive skin reactions not only to food but also to inhalants do not mean clinical or even potential allergies. The positive skin reaction must be recognized only as an important guide. The negative skin reaction in food allergy, moreover, is extremely common, especially if borderline reactions are not recorded. When skin reactions are absent one assumes that the reacting bodies are adherent to the sensitized cells in the shock organs and that humoral antibodies are not present, making it impossible to obtain a positive Prausnitz-Küstner reaction. Cooke recently stated that positive reactions usually occur to those foods productive of acute and rapid clinical symptoms, and that foods causing delayed clinical disturbances in a few hours or days or only as the result of a cumulative or a summation effect over a period of days or weeks rarely react. It is evident, therefore, that diets based on skin reactions alone commonly will fail to relieve food sensitization.

Thus, if food allergy is suspected and initial diets based on a history of possible idiosyncrasies and positive skin tests are of no help, my practice has been to use my elimination diet, modified by the history of tolerance for foods and definite skin reactions obtained by the scratch test. Modifications of my elimination diets have been suggested by Dale and Thorburg, Waters, Vaughan, Feinberg and Richet.

Recently I made revisions in the elimination diets[7] and published new menus with many choices of foods and recipes. Such diets should be used freely as diagnostic measures in the same way that other laboratory tests are utilized. Every time that elimination diets are ordered it is not necessary to assume that food allergy will be found. Success in the use of such diets depends on the absolute exclusion of all the foods not prescribed. Eating in friends' homes and in restaurants and hotels usually breaks the diet. Cooking utensils and plates must be free from even minute traces of foods other than those allowed. Diets must be used in such a manner for two to three weeks before it can be assumed that the bodies reacting to foods formerly eaten have departed from the sensitized cells, and in a few patients a longer time of exclusion may be necessary. However, in certain persons such release of the reacting bodies occurs in a few hours or days. Food allergy cannot be ruled out in the obscure problem with reasonable

7. Rowe, A. H.: Revised Elimination Diets, J. Digest. Dis. & Nutrition **1**:6, 1934.

certainty until several elimination diets have been used over a period of two or three months or even longer. It is necessary to stress the importance of interviewing the parents or patient frequently to be sure that the diet is being accurately and intelligently followed and that the caloric and metabolic requirements are being satisfied. The patient must be weighed every few days, and if any undesirable reduction in weight occurs, more calories in the form of prescribed oils, sugars and starches must be ordered.

If a milk-free diet is taken for more than a few weeks, dicalcium phosphate is best prescribed to increase the intake of calcium and phosphorus, and vitamins A and D should be added, especially from October to April. Care must be used in prescribing an oil which is included in the diet and to which no allergy exists. Thus, cottonseed oil sensitization precludes the use of carotene, which contains such an oil.

In inhalant allergy the history again is of great importance and may suggest possible sensitization to pollens, animal emanations, special household or occupational dusts or, possibly, to fungi or yeasts. Scratch tests are of special value, and intradermal tests with those inhalant allergens which have failed to cause reactions by the scratch method yield information of real worth, when compared with similar tests with food allergens. However, negative reactions probably occur in about 30 per cent of inhalant-sensitive patients. Kahn and Peshkin,[8] especially, reported negative reactions in pollen-sensitive children, and recently Stevens[9] found that 50 per cent of the persons he studied who were clinically sensitive to the inhalation of specific animal danders failed to give satisfactory skin reactions. Pollen-free and dust-free rooms in hospitals and homes are used in obscure cases in which inhalant allergy is suspected.

The frequency of reactions to house dusts was reported originally by Kern and Cooke, in 1922, and by myself, in 1927. These reactions at times indicate the preparation of special extracts of dust from carpets, upholstery and other furnishings in separate rooms.

A study of the living environment made by visiting the patient's neighborhood and home and by examination of slides for pollens to which he has been exposed is important in the uncontrolled case.

SURGICAL INTERVENTION

Surgical intervention on the sinuses of allergic children should never be done unless gross evidence of infection is outstanding, and then only as an emergency or in chronic cases after the allergy has been

8. Peshkin, M. M.: Dry Pollen Ophthalmic Test, J. Allergy **3**:20, 1931.

9. Stevens, Franklin: Comparison of Pulmonary and Dermal Sensitivity to Inhaled Substances, J. Allergy **5**:285, 1934.

adequately studied and treated over a sufficient period. To operate on the nose or sinuses of a child suffering from nasal allergy alone is futile and unjustifiable.

When allergy is under control, infected tonsils should be removed. Bacterial allergy arising from such infection may be the cause of nasal or bronchial allergy, but there is no evidence in the literature pointing to its frequency. Most allergists have observed, as was recently reported by Walzer, that bronchial asthma in children may arise after tonsillectomy, as it may after nasal surgery in adults. Rackemann and Tobey, Bullen [10] and many others have also shown that removal of the tonsils and adenoids does not favorably influence bronchial asthma.

TREATMENT

Food sensitizations demand the accurate and prolonged exclusion of the allergenic foods from the diet to enable the patient to attain increased tolerance. Hyposensitization or even desensitization to such foods occurs in months or years in some patients. In many others, however, it probably never occurs. The tendency to natural desensitization in childhood especially must be remembered. However, this is often more apparent than real. The manifestation disappears, and potential allergy to the food remains, reappearing in some other form immediately or in later years. The tendency for eczema to change into asthma or for cyclic vomiting or bilious attacks to change into migraine or gastro-intestinal allergy is generally appreciated. It is important to remember the beneficial influence of the summer months and warm weather on food allergy. Foods tolerated during this period may produce trouble from about September 15 to October 15, possibly due to changing atmospheric pressures or diminution in the ultraviolet energy in the air.

Results obtained from oral or hypodermic therapy in desensitization to foods have been disappointing, and the contentions of Urbach in regard to desensitization with his specific propeptans have had no confirmation in America.

Inhalant allergy necessitates environmental control in most patients. Pollen-free rooms are of special value until hyposensitization has been achieved. Animal emanation, dust and other miscellaneous allergies likewise require the elimination of such allergens from the living environment of the patient until therapy raises the tolerance. Desensitization necessary for permanent immunity requires a careful increase of the therapeutic agent to maximum doses with properly standardized solutions. These doses should be repeated for months or even years

10. Bullen, S. S.: The Effect of Tonsillectomy on Allergic Conditions, J. Allergy **2**:391, 1931.

until desensitization is assured. Usually it is necessary to eradicate the skin reaction to attain such results, though clinical reactions not infrequently recur, even after the skin reaction has been abolished. Prolonged therapy and willing and intelligent cooperation are the requisites for the successful eradication of pollen, animal emanation, dust and other miscellaneous inhalant allergies.

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VALUE OF THE REFLEX CONTRACTION OF THE MUSCLES OF THE MIDDLE EAR AS AN INDICATOR OF HEARING

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AND

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Investigations on the physiology of the ear have always been limited by the lack of a method of determining the function of hearing in the animal. Most of the classic research on the organ of hearing has been carried out heretofore by means of clinical observations and histopathologic examinations (for example, Bezold's investigations on otosclerosis).

A reliable method of estimating the function of hearing not only is a necessity from the standpoint of experimentation on animals but also would be of definite value if it could be adapted to clinical use and so obviate the necessity of depending on the statements of the patient as to hearing function. It is, therefore, understandable that several attempts have been made to use reflexes as an indicator of hearing. Cemach,[1] who studied them intensively named several motor responses which in his opinion are certain indicators of cochlear function. According to Cemach favorable reflexes are the acoustic pupillary reflex, the general acoustic muscular reflex and the acoustic palpebral reflex. He described among others the tensor reflex as being of no value. The employment of these so-called favorable reflexes is, however, very limited in the clinic and does not satisfactorily solve the problem. Better objective tests of hearing are required. We think that Cemach overlooked some important facts regarding the muscles of the middle ear when he called the reflex of the tensor muscle one of the most unfavorable reflexes.

The purpose of this paper is to determine the value of the reflex of the muscles of the middle ear as an indicator of hearing.

Before describing our experiments it may be advisable to mention the fundamental anatomic and physiologic facts on which the experiments are based. Since especially in the physiology of the ear even important facts are still under discussion, we consider a short preliminary description necessary.

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1. Cemach: Beitr. z. Anat., Physiol., Path. u. Therap. d. Ohres **14**:1, 1919.

The innervation of the two muscles of the middle ear was investigated by Politzer.[2] He found that the tensor tympani muscle is innervated by the nervus trigeminus which sends a branch through the ganglion oticum. The stapedius muscle is supplied by the nervus facialis. The reflex arch for the reflective movements consists of the nervus acousticus as the afferent branch and the nervus trigeminus or the nervus facialis as the efferent branch. The central part lies in the nuclear region of the fifth and seventh nerves (Hammerschlag[3]). A certain confusion exists concerning the mechanical effect of the muscular contraction. In the specimen it is easy to demonstrate that a contraction of the stapedius muscle moves the stapes so that the anterior part of the foot-plate is moved toward the tympanic cavity while the posterior part is moved slightly toward the labyrinth. But, on the other hand, it is not known definitely whether or not such movements of the stapes take place in life during contractions of the stapedius muscle. The same difficulties exist with regard to the function of the tensor muscle. No doubt the pull of the tensor muscle raises the tension of the ear drum of a specimen of temporal bone. But for the situation in life the question is much more complicated. Hughson and Crowe[4] recently expressed their opinion regarding the effect of the tensor muscle on the ear drum. They doubted that there is any effect on the tension of the membrane and assumed that the term tensor tympani may well be a misnomer. We only partially agree with these authors. Under certain circumstances a definite raising of the tension of the ear drum can be proved in man. Our previous experiments on this question indicated that voluntary movements of the tensor muscle in man do change the tension of the tympanic membrane. The same condition can be demonstrated in rabbits if one produces a strong contraction of the tensor muscle pharmacologically. We agree with Hughson and Crowe in that we consider these effects on the tension of the membrane only as accessory effects. The main point of action of the tensor muscle is in the ossicular chain.

The second important question is under what conditions a contraction of the muscles of the middle ear takes place. Here we consider only contractions in combination with sound. Although a variety of opinions on the acoustic function of the muscles still exists, this question seems to be closer to a solution in animals than in man. Historical reports about the first researches on this problem may be omitted here since

2. Politzer: Sitzungsb. d. K. Akad. d. Wissensch. Mathe.-naturw. Cl., 1861, p. 427.

3. Hammerschlag: Arch. f. Ohrenh. **47**:251, 1899.

4. Hughson, W., and Crowe, S. J.: Acta otolaryng. **18**:291, 1933.

they have been mentioned in former papers. In an earlier investigation [5] we recorded the contraction of both muscles of the middle ear of the rabbit. The peculiarities of this curve seem to give further information on the reflex. The contraction of the muscle starts with the acoustic irritation and ends with the termination of the sound. The contraction is tetanic rather than a simple jerk, as was claimed by the first research workers. Both muscles contract at the same time; they are synergists and not antagonists. The contraction takes place throughout the duration of sound and not shortly before or only during the beginning, as was claimed by the adherents of the "listening muscle" (Ostmann [6]) theory. The fact that the degree of contraction increases with the increase of the intensity of sound indicates that this is a "protective mechanism" (J. Müller,[7] Helmholtz,[8] Henle) rather than a means of accommodation (Mach,[9] Kessel, Lucae, Hensen,[10] Zimmermann, Gottstein,[11] Ostmann [12]). Furthermore, the opinion that the muscles have a dampening effect on "after vibrations" of the ear drum does not seem to fit in with the recorded kind of contraction. So one may say that the knowledge about the peculiarities of the reflex of the muscles of the middle ear in animals is rather well established.

Difficulties arise if one starts to determine how far the results of the experiments on animals can be applied to man. In the "Handbook of Physiology" by Bethe, Bergmann, Embden and Ellinger [13] the authors considered the movements of the tensor and the stapedius muscle in animals as definite. But in man they admitted a function of the muscles of the middle ear only "for a few individuals." The mobility of the muscles "seems to be so small, that it has escaped notice in the methods so far employed." However, Lüscher [14] was able to show that one can see the movements of the stapedius tendon in man by means of his ear drum microscope. We have seen patients in whom the stapedius tendon moved in response to acoustic irritation to such a degree that

5. Kobrak: Beitr. z. Anat., Physiol., Path. u. Therap. d. Ohres **30**:255, 1932; **28**:138, 1930; **29**:383, 1932.

6. Ostmann: Arch. f. Anat. u. Physiol., 1899, p. 546.

7. Müller, J.: Handbuch der Physiologie des Menschen für Vorlesungen, Coblenz, J. Hölscher, 1840.

8. Helmholtz, H. L. F.: Die Lehre von den Tonempfindungen, Braunschweig, F. Vieweg & Sohn, 1863, p. 216.

9. Mach, E.: Kaiserl. Akad. d. Wissensch. **48**:283, 1863.

10. Hensen, V.: Arch. f. Anat. u. Physiol., 1878, p. 312.

11. Gottstein, J.: Arch. f. Ohrenh. **16**:61, 1880.

12. Ostmann: Arch. f. Ohrenh. **46**:14, 1899.

13. Bethe, A.; Bergmann, G.; Embden, G., and Ellinger, A.: Handbuch der normalen und pathologischen Physiologie, Berlin, Julius Springer, 1926, vol. 11, p. 421.

14. Lüscher: Ztschr. f. Hals-, Nasen- u. Ohrenh. **23**:105, 1929.

the movements could be seen with the naked eye. The opinion that the muscles of the middle ear are "rudimentary and without active function" seems finally to be weakened so far as the stapedius muscle is concerned. The actions of the tensor tympani muscle are (still) more doubtful. Because of the anatomic peculiarities no one has been able, so far, to observe any movement of this muscle in man. Although definite proof of the physiologic activity in man is lacking, the likelihood of there being a function seems to be increased by experiments on animals. The lack of mobility of the ear drum during acoustic irritation has been one reason for doubt. All authors have agreed that one cannot see any movement of the tympanic membrane, even with the highest power of the ear microscope. On the other hand, considerable movement may be seen on examination of one of the few persons who are able to contract the tensor muscle voluntarily. Besides this, a third group of observations exist that can be carried out only on certain people. These persons show definite voluntary movement of the ear drum during very shrill and disagreeable sounds (Mangold and Eckstein [15]). These observations have led to the opinion that the tensor muscle is in action only in these few persons.

In consequence, we performed the following animal experiment: The bulla ossea of the animal was opened, the movements of the muscles were observed and the observations were later recorded. Simultaneously an observation of the ear drum from the outer canal was carried out. The result was that the tensor muscle was seen to contract, but the ear drum did not show any movement so far as could be determined by a microscope. From this observation we assume that the lack of mobility of the ear drum is no reason to doubt that contractions of the tensor muscle take place in man in response to acoustic irritation.

Furthermore, the other reasons which have tended to disprove the activity of the tensor muscle in man do not seem convincing. Those persons who show the reflective movements are conscious of a definite noise in their ears during contraction of the muscles. This noise is interpreted as "muscle noise." As one does not hear any kind of muscle noise during the sensation of hearing, the conclusion was drawn that the muscle does not contract. A comparison may show, however, why this assumption is not warranted. For example, one does not normally hear the pulsation of the vessels of the ear. But as soon as conditions in the blood vessels are changed, for instance in the formation of aneurysm or with inflammation, one hears the murmur in the vessels. In the same way, we explain the conditions of the muscle noise. The voluntary contraction is different from and, as we assume, stronger than the normal physiologic acoustic contraction caused by

15. Mangold and Eckstein: Arch. f. d. ges. Physiol. **152**:589, 1913.

tones. So it seems understandable that the normal muscle noise is eliminated psychically and that only the unusual and stronger muscle noises are heard.

Another marked difference between the kinds of contraction exists in the condition of fatigue. The voluntary contractions can be maintained only a very short time (several seconds) and cannot be repeated very often; on the other hand, the acoustic reflex of the tensor muscle in the animal almost never shows fatigue (Lüscher [14]). We have performed experiments on animals in which we have irritated the tensor muscle by sounds with only short intervals for hours and in which there was no change in the strength of the contractions. For these various reasons we proposed not to consider the activity of the tensor muscle as a unit but to divide it into the types of contractions noted in table 1.

TABLE 1.—*Different Types of Contraction of Tensor Muscle*

No.	Type	Subjects Observed	Incidence	Audible Muscle Noise	Change in Tension of Ear Drum	Fatigue	Visibility of Movements of the Ear Drum
1	Voluntary	Man	In a few	Yes	Yes	Early	Yes
2	Reflective	Man	In a few	Yes	Yes?	?	Yes
3	Physiologic or acoustic	Rabbits, dogs, cats, etc.; not yet in man	In almost all experimental animals	....	No	Almost no	No
4	Nonacoustic	Experimental animals	By squeezing the pinna or by electric irritation of facial nerve	?	?	?	?
5	Pharmacologic	Rabbits	Nicotine	?	Yes	....	Yes

This discussion and classification of the contraction of the tensor muscle are given here because the confusion in the literature has delayed the use of the reflex of the muscles of the middle ear as an indicator of hearing for physiologic experiments. Although we are not able to prove definitely the existence of an activity of the human tensor tympani muscle analogous to the findings in animals, we hope to succeed in proving that there is, according to this classification, no reason further to doubt it. When we talk of the reflex of the tensor muscle we refer to the physiologic or acoustic contraction mentioned in table 1 under number 3. How the nonacoustic movements are avoided in the experiments will be mentioned during the description of the method. However, we do not believe that nonacoustic movements of the tensor disturb the readings of the reflex or diminish the value of the acoustic reflex as an indicator of hearing. Is the value of the pupillary reflex diminished because it may contract as a result of irritations other than light?

EXPERIMENTAL PROCEDURE AND MATERIAL

The first part of our experimental work was devoted to the determination of the value of the tensor reflex as an indicator of hearing in animals. Three important requirements had to be fulfilled: first, a well defined and reproducible sound; second, a well defined reflective response, and, third, a considerable constancy of the results. The source of sound we used in our experiments was an audiometer connected with an amplifier and a loud-speaker.

As animals for experiment rabbits were used exclusively. The observation of the muscular reflex can be carried out with the naked eye, a lens or a microscope. For the sake of uniformity of results the same procedure for reading the contraction was always used. The magnification provided by a 15 diopter lens has the advantage of convenience and sufficient magnification without the disadvantages connected with the use of a microscope. Of great importance was the question of general anesthesia, since any narcotic drug alters the reflective responses. Our constant procedure consisted in producing shallow general anesthesia by intravenous injection of ethyl carbonate (urethane), the dose of which was from 0.4 to 0.5 Gm. per kilogram of body weight. A 10 per cent solution at body temperature was injected slowly into a vein of the ear. The method of exposing the muscles for readings varied a little from those formerly used by Kato[16] and recently by Lorente de Nó.[17] We exposed the bulla and opened the tympanic space from the ventral side, so that touching the parts of the middle ear was absolutely avoidable. The routine position of the animal was the recumbent position and the loud-speaker was placed 5 inches (12.7 cm.) from the left ear of the animal, the pinna making a 45 degree angle with the body. The outer ear was examined otoscopically, and only animals with ears entirely free from wax or discharge were selected. In contradistinction to Lorente de Nó's procedure, we did not connect the loud-speaker with the outer acoustic canal by means of a rubber tube and did not amputate the pinna. Even if the technic of Lorente de Nó provided a more constant application of sound, our procedure seemed to be easier and more natural. Experiments have proved that small changes of the position of the pinna and even very small changes in the distance of the loud-speaker do not noticeably alter the reflex. However, a marked change in the distance of the loud-speaker was, as a matter of course, followed by a definite change of the reflex.

We further had to determine whether the simple opening of the bulla ossea does or does not produce a definite change of the conditions of the conduction of sound. Although no parts of the middle ear were touched by our operative procedure, the simple opening of the tympanic cavity could change the conditions of sound in two ways: First, the drill-hole in the bulla could destroy any physiologic pressure which might be unequal to the atmospheric pressure. Pohlman and Kranz[18] have assumed that the normal physiologic pressure is slightly below the atmospheric pressure. This opinion seems unlikely to us, but we have not been able to determine the normal pressure of the middle ear without any manipulation on this cavity. However, we have investigated recently the influence of changes of pressure in the middle ear and have found that small changes of pressure do not alter the reflex movements of the tympanic muscles. A second means of possible change of the conduction of sound may be due to a direct application of the sound through

16. Kato: Arch. f. d. ges. Physiol. **150**:569, 1913.

17. Lorente de Nó, R.: Laryngoscope **43**:315, 1933.

18. Pohlman, A. G., and Kranz, F. W.: Ann. Otol., Rhin. & Laryng. **32**:545, 1923.

this artificial opening. To answer this question we performed the following experiment: A reading was carried out first in the usual way. Then the opening of the bulla was closed by a piece of cover-glass. The glass was fixed with petrolatum or putty so that no air could penetrate. Provided the loud-speaker was not too close to the animal, the reading taken through the "window" did not differ from that taken with the open bulla. So we assume that our method did not alter the conditions of physiologic conduction of sound.

The routine readings were taken in the following way: The observer used a head mirror for lighting the cavity of the bulla and a lens for magnifying the field. The production of sound was carried out by an assistant, who also wrote down the results. For the sake of objectivity the observer was not informed about his readings until the results were complete. As often as possible the readings were checked by a second observer. As the threshold of contraction was

TABLE 2.—*Readings on the Threshold of the Tensor Muscle in Rabbits*

Frequency of Tone	Threshold		
	Average	Maximum	Minimum
256	56.6	68	45
512	63.3	74	45
1,024	55.0	64	44
2,048	33.5	54	13
4,096	34.4	52	17

TABLE 3.—*Readings on One Rabbit* *

Frequency of Tone	Reading								
	1	2	3	4	5	6	7	8	9
256	54	54	54	54	54	54	54	54	54
512	54	54	54	54	56	57	56	55	54
1,024	44	44	44	44	46	44	44	45	45
2,048	24	24	23	24	27	26	26	27	27
4,096	17	17	17	17	17	18	19	19	21
8,192	7	7	6	9	6	7	10	8	7

* An injection of 12 cc. of ethyl carbonate was given at 2:15 p. m. The first reading on the right tensor muscle was made at 3:10 p. m., and the last reading was made at 6:20 p. m.

used the readings varied a little according to the visual power of the observer. However, the curves obtained by two different observers compared favorably with audiometer curves taken in the clinic by different observers on the same patient.

Our experiments performed for the determination of the normal average threshold of the tensor muscle spanned about sixty readings. In table 2 the maximum, minimum and average thresholds are given. The readings showed a rather wide spread. It may be pointed out, however, that the great difference between the maximum and the minimum was due chiefly to a few widely diverging readings but that the majority of the readings adhered closely to the average values (chart 1). Possible explanations for the variations in the reflex response may be the age and general irritability of the animal, the depth of narcosis and disturbances due to environment or changes in the sound-producing network.

Among several hundred animals operated on during the past six years we have found some in which no contraction of the tensor muscle was seen. In these cases, however, the reflex of the stapedius muscle was always present. We have not been able to detect the reason for the absence of the reflex in these few cases.

The readings obtained from the same animal at different times showed a much greater degree of uniformity than readings from different animals. For instance, for an animal that was observed every twenty minutes over a period of several hours the readings were remarkably constant (table 3).

If one wants to observe an animal over a longer time it is necessary, of course, to use aseptic precautions. Chart 2 shows readings for an animal that was operated on on six successive days.

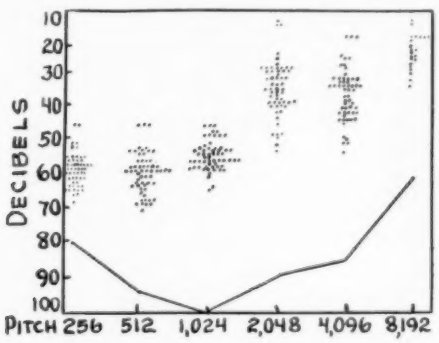

Chart 1.—Over fifty determinations of the normal threshold of contraction of the tensor muscle. Each reading is represented by one dot. The line below represents the maximum of sound intensity producible by the audiometer.

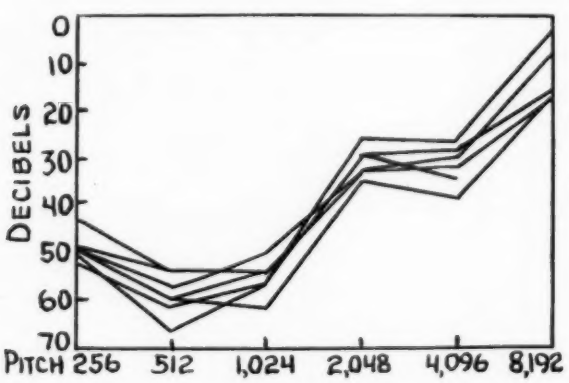

Chart 2.—Six readings on the tensor contraction of the muscles of the same animal on six successive days. Note the conformity of the curves.

We performed further experiments, the purpose of which was to compare the threshold of the left and the right tensor muscle. Just as the pupils contract together when only one pupil is lighted, so the muscles of the middle ear contract on each side when only one side receives an acoustic irritation. From our experiments for the comparison between the reflex on the right and that on the left side we give an example in table 4.

Experiments comparing the contraction of the tensor muscle with that of the stapedius muscle have been carried out previously, as well as investigations more recently by Lorente de Nó. Therefore, they may be omitted here.

RECORDING OF CONTRACTIONS OF THE TENSOR MUSCLE

The experiments described so far were carried out simply by observing the contraction of the tensor muscles. Besides that we also recorded the contractions by a small mechanical device. The recording of the jerks has the advantage of depriving the results of a variety of subjective errors. Further, it enables the research worker not to restrict himself to the determination of the threshold intensity but to determine the amount of contraction of the muscle for each sound of any overthreshold intensity. This differs from the clinical test of hearing in that no patient is able to say "This sound is twice or three times as loud as the former." In any clinical examination only the threshold can be used either qualitatively or quantitatively. The recording of the acoustic contractions of the tensor muscle was accomplished by means of a small hook connected with a tiny pulley by a silk thread. The axis of this pulley carried a mirror, by means of which the pull of the contracting muscle was recorded optically by deflection of a beam of light.

The determination of the degree of contraction produced by sounds of different pitch and different intensity was derived in the following way: The normal position of the reflected light was first marked on a screen. As the contraction of the muscle lasted as long as the sound, the point of light on the screen took a new

TABLE 4.—*Readings on the Contraction of the Tensor Muscles on Each Side When Exposed to the Same Acoustic Irritation*

Frequency of Tone	Threshold Contraction of Right Tensor Muscle	Threshold Contraction of Left Tensor Muscle
256	64	63
512	66	65
1,024	63	62
2,048	38	41
4,096	34	42
8,192	24	27

position and remained there throughout the duration of the tone. The new position could be easily marked on the screen. As a matter of course, the deviations of the point of light were not absolute determinations of the degree of the contraction. However, they offered a good means of quantitative calculations of the different reflex movements.

First, we shall give the threshold recorded by the mechanical device and compare it with the threshold determined by direct observation at a second operation one day later (chart 3). Although the threshold was obtained on two different days and by two different methods, the results show satisfactory conformity. Furthermore, we tried to find out whether a certain lawful relationship between the stimulus and the contraction of the muscle does or does not exist. For this purpose curves were made in which the intensity of the sound was taken as the abscissa and the measured amount of the contraction of the tensor muscle as observed on the screen was taken as the ordinate. Chart 4 gives the relationship for several pitches. The curves show uniformly that the increase of the intensity of the sound produces a greater increase of the reflex contraction away from the threshold than it does near the threshold. In other words, near the contraction threshold at 75 the increase of the sound for 5 decibels produces only a contraction that gave a 3 mm. greater excursion on the screen than the former sound. But the same increase of the acoustic irritation from 90 to 95 decibels produced an increase of the contraction of about 14 mm. on the screen. We found this behavior of the curves in all pitches, with only one exception, 2,048. In this case, when

extreme intensities were used the curve showed a deviation in the opposite direction, although with the lower intensities the curve corresponded to the curves for the other pitches. But for the extreme degrees our recording device may be insufficient and so account for the apparent exception in the case of the frequency of 2,048.

We also tried to consider the different intensities of the reflex from another standpoint. Theoretically it is possible that a patient may have a rather normal curve for the threshold of hearing, but his overthreshold sensitiveness may be proportionally smaller than his threshold of hearing would allow one to assume. These patients would tell the doctor that they are handicapped remarkably by their trouble in hearing, whereas the audiometer curve does not reveal much deviation

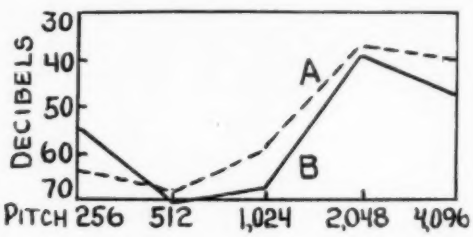

Chart 3.—Comparison between the recording and the reading of the tensor threshold. *A* indicates the mechanically recorded threshold, whereas *B* indicates readings by direct observation. Note the conformity.

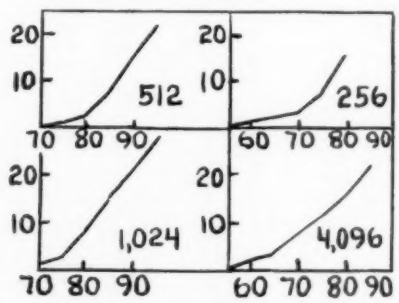

Chart 4.—The intensity of contraction of the tensor muscle in relation to the sound stimulus for several pitches. The abscissa indicates the intensity of sound in decibels and the ordinate, the contraction of the tensor muscle defined in millimeters as it was measured on a screen by means of an optical recording device. Note the shallow course of the curve in the region of lower intensity and the steeper course in the region of higher intensity.

from normal. One must realize that the clinical test deals only with thresholds and that in these assumed cases judgment would be misled by the testing procedure. As we believe that the degree of the reflex contraction is a true mirror picture of the degree of the sensation of hearing, we studied the shape of curves of hearing when not the threshold intensity but any overthreshold intensity was taken as a means of measurement. Therefore, a curve was drawn in which were recorded the intensities of the different pitches which gave a certain excursion on the screen Another line represented intensities that gave a greater excursion and so on. As

is demonstrated in chart 5, all the overthreshold curves run nearly parallel. With this method we were able, at least in the experiments on animals, to get information as to the perception of each overthreshold intensity. It might be of value to attack the problems involved in the Weber-Fechner law, using the tensor reflex as an indicator of hearing which is not restricted to the threshold. For our purpose the curve seems to indicate that the threshold offers enough information about the ability to hear, since the greater responses due to stronger irritations resemble the threshold curve closely.

OBSERVATIONS OF THE REFLEX OF THE STAPEDIUS MUSCLE IN MAN

As mentioned before, true reflex movements of the tensor muscle have not yet been observed in man. The movements of the stapedius tendon were seen first by Luescher through a perforation of the ear drum. We also have seen several

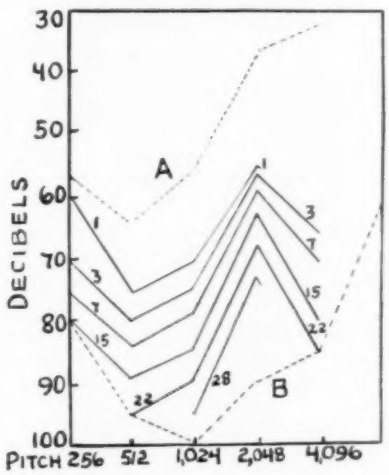

Chart 5.—Recording of overthreshold intensities. Contractions of equal intensity are combined. The unbroken line *1* indicates contractions that gave a 1 mm. excursion on the screen; *7*, contractions that gave a 7 mm. excursion, etc. Note that the curves run nearly parallel and that they resemble the threshold curve. *A* indicates the average threshold curve (table 1). *B* indicates the maximum intensity producible by the audiometer.

cases in which the stapedius tendon was visible through a favorable perforation of the ear drum or was made visible by our method of making the ear drum transparent in the posterior superior part (optical perforation).[19] However, the development of the electric sound-producer was not advanced at that time, so only pipes could be used as sound-producers. Now we have been able for the first time to use the same sound-producer for the examination of the sensation of hearing and of the reflex movements. The patients on whom one can observe movements of the stapedius tendon are not so rare as one would conclude from the small number of observations mentioned in the literature. For our purposes we used

19. Kobrak: Ztschr. f. Hals-, Nasen- u. Ohrenh. **32**:8, 1932.

the observations on man for the question of how far the hearing curve and the threshold of contraction of the stapedius muscle run parallel, in other words, the relation between the contraction of the muscle and the sensation of hearing.

Chart 6 is a record of observations on a boy 13 years of age who was operated on four years ago (simple mastoidectomy). The picture in the ear drum showed on the right side a perforation in the posterior part through which one could see the head of the stapes and the tendon of the stapedius muscle. There was a con-

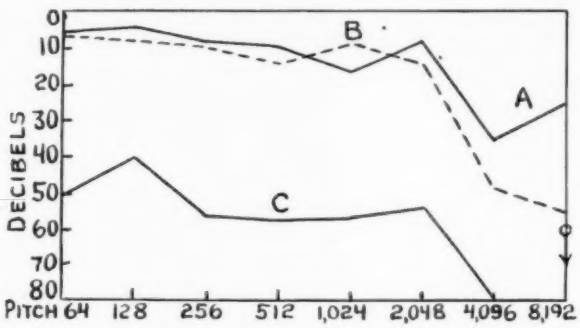

Chart 6.—Audiometer hearing curve for both ears and curve of the reflex of the stapedius muscle of the right side of a boy 13 years old. The sound for the test of the reflex of the stapedius muscle was produced by the audiometer connected with an amplifier system. Note the parallel direction of the curves. *A* indicates the contractions of the muscle of the right ear. *B*, readings for the left ear and *C*, the curve of the reflex of the stapedius muscle.

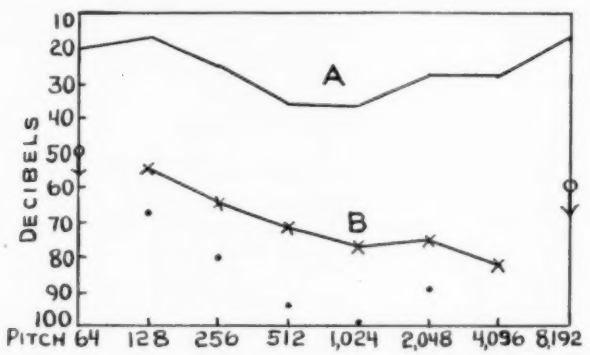

Chart 7.—Audiometer curve for the left ear (*A*) and readings of the reflex of the right stapedius muscle (*B*) of a boy 12 years old. The readings of the reflex of the stapedius muscle were taken while the audiometer telephone membrane was on the left ear of the patient. There was no amplification. The difference between the curves was 35 decibels. Note the parallel direction of the curves. The absence of the reflex with tones of a frequency of 128 and 8,192 merely indicates that the maximum intensity of the audiometer fell below the threshold of contraction in these two instances.

siderable discharge from both ears. The tendon showed definite movements in response to whistling or application of Bárány's noise box. The test of hearing

was performed in the usual way with an audiometer, using a telephone membrane on the patient's ear for the application of sound. As the curve indicates, the hearing was rather good on both sides if one takes the bilateral active lesion into consideration. With the telephone membrane attached to the patient's left ear the observer could see during several pitches definite movements of the tendon that were about 70 sensation units lower than the threshold of hearing. The observation was performed with a simple 15 diopter lens. For several pitches the maximal intensity of the audiometer was not sufficient to produce a reflex movement. For this reason we used an amplifier system in order to produce reflex jerks by all pitches delivered by the audiometer. The curve thus obtained is shown in chart 6. The intensity of sound that now reached the ear could be estimated from the peculiarities of the loud-speaker and the amplifier. However, since we are concerned only with giving an idea of the approximate shape and site of the curve, we have omitted the rather difficult measurement of the effect of amplification. The distance between the two curves may depend on a variety of things which are peculiar only to the immediate case (for instance, conditions of the inner ear, adhesions of the ossicles or of the tendon itself). So the number of decibels between the hearing curve and the reflex curve as a matter of course is not constant. We found the difference in another patient to be only from 30 to 40 decibels (fig. 7). A third patient showed a difference of 45 decibels. The observation of the muscle reflex may be of definite value in cases of suspected malingering.

SUMMARY

The purpose of these experiments has been to determine the value of the acoustic contractions of the muscles of the middle ear as an indicator of hearing both in animals and in man. The first object of this paper was to remove difficulties in the explanation of some physiologic observations on animals and on man which have been conflicting and so have led to the opinion that the reflex of the tensor tympani muscle observed in animals cannot be compared with movements of this muscle in man. A separation of the contractions into a number of qualitatively and quantitatively different kinds is proposed here, and the assumption is made that there is no longer any reason to doubt similar movements of the tensor muscle in man. The almost entire similarity of the reflex of the tendon stapedius is mentioned, and new observations on this reflex are added.

The testing of the reflex of the tensor tympani muscle as an indicator of the sensation of hearing of the animals used in the experiment revealed the following results:

1. The acoustic contractions of the tensor muscle are almost always present in rabbits and allow easy quantitative measurements under the same procedure as a clinical test with the audiometer. Quantitative comparison of the contractions in different animals does not always show satisfactory uniformity.

2. Continued observations on one animal over several hours show a remarkable constancy. The reflex is therefore reliable as an indicator of hearing for acute experiments.

3. Continued observations on one animal over several days (several readings taken under aseptic procedure) show a high degree of constancy.

4. Comparison of the response of the left and that of the right tensor muscle does not show any considerable variation.

5. Small changes of the position of the animal and especially of the position of the pinna do not produce considerable differences, so it is not important to place too much significance on minute displacements of the loud-speaker or of the animal. The application of the sound may be carried out in the natural way and not necessarily by means of rubber tubes.

6. The comparison between the readings of two different but equally trained observers shows a constancy which is about equal to that in clinical tests of hearing.

7. Besides the simple observations on the tensor muscle we also made records of the contraction, by means of which we were able to determine the amount of the response for a variety of overthreshold irritations. The proportion between the irritation and the reflex under various conditions is shown.

Besides the experiments in rabbits, observations on the stapedius reflex in man have been carried out. For the first time it was possible to compare the curve of hearing and the curve of the reflex response of the stapedius muscle quantitatively and to express the difference in decibels. The inconstancy in the distance between the two curves is probably due to individual peculiarities of the middle ear (adhesions of tendon). However, the relationship between the two curves is such that a good curve of the reflex of the stapedius muscle may be taken to indicate a relatively good curve of hearing. This might be used clinically, for example, in cases of malingering.

SUBCORTICAL FISTULAS OF THE ANTERIOR SURFACE

THEIR MANAGEMENT IN SUPPURATION OF THE PETROUS PYRAMID

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Because of an increasing interest in suppuration of the petrous pyramid and the accumulation of greater experience in the management of this condition it is to be expected that new ideas and methods of treatment will be evolved. It is becoming a well established fact that a fistula extending into the apex area through a pneumatized pyramid is frequently present in cases of suppuration of the petrous pyramid. It is questionable, however, whether such a fistula can be discovered in every case. Perhaps progress in the surgical management of this condition will some day enable otologists to determine this.

This article deals with the management of suppuration of the petrous pyramid when a fistula is found above the plane of the horizontal semicircular canal, external (lateral) to or above the plane of the superior semicircular canal and beneath the cortex of the anterior surface, which is called the superior surface by some authors. Our experience indicates that in addition to a tract of diseased bone or a fistula which leads into the apex there may be an area of diseased bone adjacent to the fistulous tract. This can influence the behavior of the local lesion even after the fistula has been enlarged.

Kopetzky [1] stated that "in cases where fistulas are found in front or behind the superior semicircular canal—all that is required in order to reach the apex is the use of the probe to determine its direction, and to widen the tract, and the use of the burr to increase its periphery." In cases in which such a fistula has been found and enlarged the possibility remains that this operative procedure may not arrest the progress of the infection. This may be due to two factors: First, the drainage provided by the enlarged fistula may not be adequate to keep the apex area of the cell properly emptied. The combination of the apex and the fistula represents a bottle neck arrangement which in some cases

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1. Kopetzky, S. J.: Problems Concerned with Empyema of the Petrous Apex, Arch. Otolaryng. **18**:47 (July) 1933.

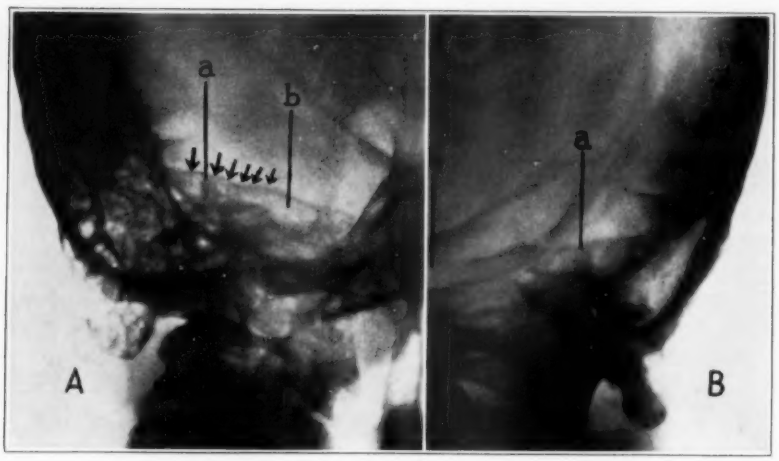

Fig. 1 (case 1).—*B*, roentgenogram showing the left petrous pyramid before operation. The normal right side (*A*) is shown for comparison. The left apex shows diffuse clouding and lack of definition of its superior line. The arrows point to the bottle neck arrangement; *a* indicates the superior semicircular canal; *b*, the apex cell area.

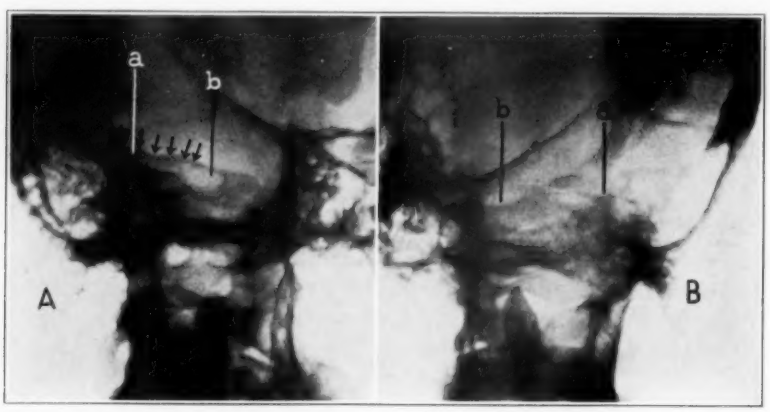

Fig. 2 (case 1).—*B*, roentgenogram showing the left petrous pyramid after the first operation. The line of the superior border is still intact except for that of the apex cell area. The arrows point to the bottle neck arrangement; *a* indicates the superior semicircular canal; *b*, the apex cell area. *A* shows the uninvolved right side.

may prevent the required drainage. The neck of the bottle reaches its narrowest point between the cortex and the superior semicircular canal. A fistula located here can be enlarged between the cortex and the superior semicircular canal only within certain narrow limits or not at all. The bottle neck arrangement is well illustrated in roentgen films of some pneumatized petrous pyramids (figs. 1 and 2). Second, there may be disease of the cortex and of the subcortical bone adjacent to the fistula. The presence of diseased bone adjacent to the fistulous tract constitutes a real threat to the intracranial structures. It can therefore be understood that enlargement of the fistulous tract may not suffice in some cases. Because of these factors it becomes necessary to enlarge the drainage tract so as to insure the egress of the products of necrosis of bone and at the same time to remove, wherever possible, the diseased bone adjacent to the fistulous tract.

This objective was accomplished in two cases by uncapping the anterior (superior) surface of the petrous pyramid in addition to making a trough of the previously existing fistula. Our experience in the first case demonstrated that enlarging the fistulous tract may not be sufficient to insure a cure, for the cortex and adjacent structure may be involved. Disease of the cortex precedes involvement of the dura; therefore the possibility that the cortex is diseased must be borne in mind. Two recent cases are reported:

REPORT OF CASES

CASE 1.—A colored woman, 22 years of age, was admitted to the hospital on April 10, 1934, complaining of sore throat, headache, pain in the left ear and fever. Five days before admission pain developed in the left ear; the ear discharged spontaneously two days later. Sixteen days after admission a simple mastoidectomy was performed because of a profuse purulent discharge, headache, sagging of the posterior superior wall of the canal and nipple formation of the drum membrane. Coalescent mastoiditis in an extensively pneumatized bone was revealed at operation.

The postoperative course was satisfactory until the eleventh day, when the temperature rose to 101 F. and the patient complained of pain behind the left eye, which was present both night and day and was more severe in the evening. The temperature ranged between 99 and 101 F. until the seventeenth day, when it rose to 104.8. This rise in temperature was accompanied by a chill. A culture of the blood and examination of the spinal fluid gave negative results at this time. Roentgen study of the petrous pyramid as reported by Dr. Rendich and Dr. Ehrenpreis indicated clouding of the apex area and haziness of part of its superior line, which were not present in the roentgenogram taken before the mastoidectomy was performed (fig. 1). At this time a profuse discharge from the mastoid wound and from the external canal was also noted. Sagging of the wall of the superior canal was present, and a nipple-like process could be seen posteriorly coming from the region of the drum membrane. During all this time pain behind the left eye persisted. A fair degree of hearing was present. There

was a small area of thickened skin in the postauricular region, which was considered as the possible beginning of erysipelas. The subsequent course indicated that the chill already mentioned was probably due to the erysipelas, which was difficult to diagnose at so early a stage in a colored person. On the following day, May 14, the temperature was 104 F. and two nipples were now evident coming from the region of the drum membrane, one anteriorly and the other posteriorly. Operation was decided on, the possibility of sinus thrombosis in addition to the involvement of the petrous pyramid being borne in mind.

Operation was performed on May 14, eighteen days after the mastoidectomy. The mastoidectomy wound was reopened; the sigmoid sinus was exposed and found to be apparently normal. The perilabyrinthine area was carefully examined; a

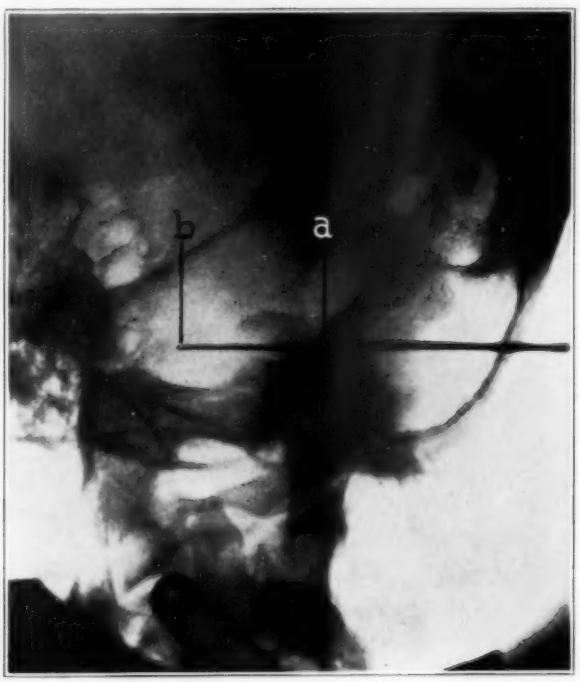

Fig. 3 (case 1).—Roentgenogram showing the left petrous pyramid after the second operation. A probe was passed into the tip along the trough made by removing the cortex and enlarging the fistula. Loss of definition of the superior line of the shadow of the petrous pyramid may be noted. *a* indicates the superior semicircular canal; *b*, the apex cell area.

small black spot which proved to be the mouth of the fistula was found in the region above the plane of the horizontal canal and external (lateral) to the superior canal. A probe was inserted toward the apex. Following its withdrawal there was a gush of creamy pus. The fistulous tract was enlarged with the smallest-sized curet, no 000 (fig. 2).

On the following day the condition of the patient was worse. The neck had become rigid, and a positive Kernig sign was present. The spinal fluid was under pressure and contained 325 cells per cubic millimeter, 75 per cent of which were polymorphonuclears. No organism was found. It was believed that the infection

was extending to the meninges and that although the previously enlarged tract was still patent it was inadequate for proper drainage. Very likely disease of the petrous pyramid existed in addition to the fistula which was causing an intracranial complication. A second operation was therefore performed on the petrous pyramid twenty-four hours after the first. This was done in the presence of recognizable erysipelas of the wound.

The roof of the fistula and a large area of softened cortex above the labyrinth were removed as far as the tip of the apex. The dura over this cortical area was found to be acutely congested. The bone of the cortex was found to offer little resistance to the instrument during its removal because of the extreme softening. As the fistula was uncapped a large quantity of trapped pus (about a teasponful) was evacuated. The bone removed extended along the anterior surface from a point above the external and superior canals into the tip of the apex and included the cellular bone above the internal auditory meatus. It extended both anteriorly, and posteriorly, creating a much widened tract which resembled a trough. A rubber tissue drain was placed along the excavated anterior surface down to the tip of the apex. A roentgenogram was taken of the petrous pyramid with a probe placed in the excavated portion. This roentgenogram, taken in the Stenver position just after the operation, showed that the line of the superior border was almost completely lost (fig. 3). Five months later a roentgenogram showed a return of this line.

The pain disappeared the next day. The temperature remained between 102 and 104 F. for seven days and then gradually receded until it reached normal fifteen days after the last operation. The fever was in part due to the erysipelas.

Comment.—In the first operation on the petrous pyramid a fistula was found above the plane of the horizontal canal and external (lateral) to the superior canal. This was enlarged. Despite this, signs of meningeal irritation appeared the next morning which indicated that the procedure was not sufficiently extensive to prevent progress of the disease. Operation performed that afternoon revealed necrosis of the cortex of the anterior surface, with extensive softening of the subcortical tissue and the presence of free pus. The presence of erysipelas was disregarded.

Case 2.—A white girl, aged 7 years, was admitted to the hospital on May 12, 1934, with the history of a discharge from the right ear for three days. At this time there was a pulsating discharge coming from an antero-inferior perforation of the drum membrane. The patient remained in the hospital for twelve days, during which time there were little elevation of temperature and no local signs indicating the necessity for an operation on the mastoid. The patient was referred to the outpatient department for further care and observation. On June 15, thirty-seven days after the first earache, she was readmitted to the hospital. Her temperature was 103 F., and she complained of dull pain in the head above the right ear. On June 24, the forty-sixth day of her illness, paralysis of the right rectus muscles was noticed. At this time also she complained of pain over the right eye in the evening. This pain recurred twice during the night and was sufficiently severe to awaken her. It returned during the next three nights; it never occurred during the day. The temperature was now between 99 and 101 F., and the pulse rate varied between 90 and 120. There was a slight mucopurulent discharge coming from an antero-inferior perforation. There was no tenderness of the mastoid,

nor were there any signs pointing to disease of the mastoid process requiring surgical intervention. The whispered voice could be heard at a distance of 2 feet (60.96 cm.). Examination of the spinal fluid at this time gave negative results.

The report on the roentgen studies made by Dr. Rendich and Dr. Ehrenpreis was as follows: The right mastoid was of moderate size and pneumatic. There was evidence of infiltration and softening of the cellular septums of this process, but no definite evidence of destruction was noted. Examination of the right petrous apex was strongly suggestive of destructive changes in this area. The upper line of the apex was absent in roentgenograms taken in the Stenver position. Examination of the left side revealed a pneumatic mastoid and a petrous pyramid showing normal aeration (fig. 4).

Because of the long history of otitis media, the low grade sepsis, the ocular pain, the paralysis of the sixth nerve and the suggestive roentgen findings, operation was performed on June 29, the fifty-first day of the illness. The usual post-

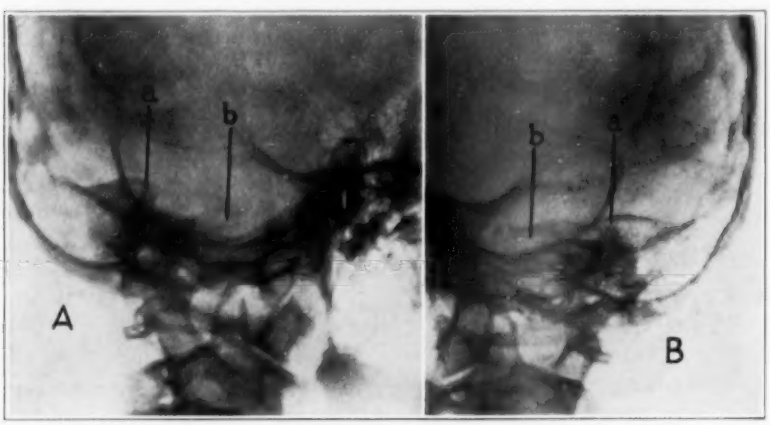

Fig. 4 (case 2).—*A*, roentgenogram of the involved right petrous pyramid before operation, compared with the uninvolved left side (*B*). The perilabyrinthine area is more clouded; the outline of the apex is poorly defined and clouded. Note the cellular structure on the uninvolved side from the superior canal to the apex. *a* indicates the superior canal; *b*, the apex.

auricular incision was extended upward to the root of the zygoma. The areas of the tip and antrum revealed a moderate amount of softening. There was no free pus in the region of the mastoid. After a thorough simple mastoidectomy was performed the tegmen of the mastoid and of the antrum was removed. A fistula was found above the plane of the horizontal canal and external (lateral) to the superior canal. The mouth of the fistula was filled with granulation tissue. When the probe reached a depth of about 2 cm. there was a sudden gush of greenish-yellow pus, about ½ drachm (1.9 cc.). The probe led in the direction of the apex. The temporosphenoidal lobe of the brain was then elevated, and the cortex of the anterior surface was removed above the plane of the horizontal semicircular canal from the perilabyrinthine area to the tip of the apex. The floor of this excavated area was gently curetted and the granulation tissue removed. A strip of rubber tissue was

placed along the newly made tract. In a roentgenogram taken shortly after the operation the upper line of the petrous pyramid was replaced by a faint indefinite line (fig. 5).

The pain over the eye and the headache disappeared on the day following the operation. The temperature was normal on the fifth day, and the patient made an

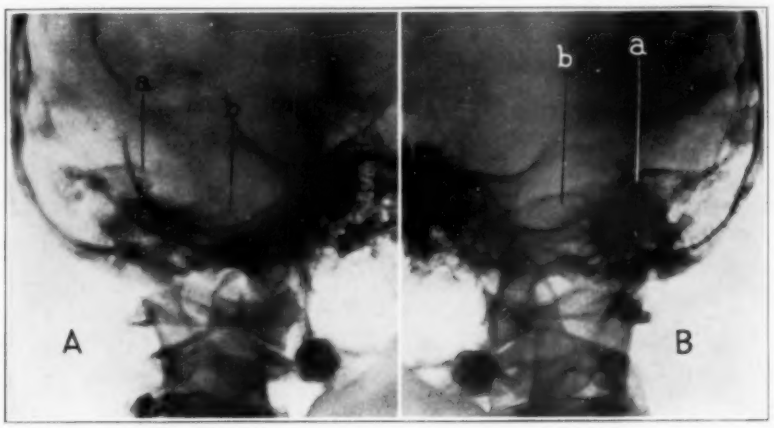

Fig. 5 (case 2).—*A*, postoperative roentgenogram, showing loss of detail of the upper line of the petrous pyramid. *B* shows the uninvolved side. *a* indicates the superior semicircular canal; *b*, the apex.

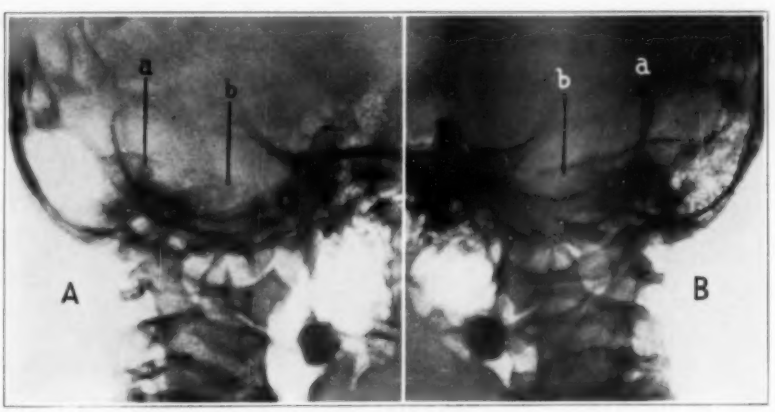

Fig. 6 (case 2).—*A*, roentgenogram taken five weeks after operation. There is returning definition of the line of the upper border. Comparison with figure 4 should be made and clearing of the perilabyrinthine area noted. *B* shows the uninvolved side. *a* indicates the superior canal; *b*, the apex.

uneventful recovery. The middle ear was dry at the end of two weeks, and the mastoidectomy wound was dry three weeks after the operation. The paralysis of the right rectus muscles disappeared on the thirtieth day. A roentgenogram taken five weeks after the operation revealed some evidence of a return of the line of the upper border of the petrosa (fig. 6).

Comment.—After seven weeks of mild otitis media without signs of mastoiditis requiring surgical intervention, this patient showed signs of suppuration of the petrous pyramid. This case differs from most cases of infection of the petrous pyramid in that mastoidectomy had not been performed previously. It is to be noted that extensive removal of the squamous portion of the temporal bone was not necessary to gain access to the region of the petrous tip. The entire procedure was carried out through an incision in the mastoid region extended upward to the root of the zygoma. Despite the presence of extensive necrosis in the petrous bone, there was little discharge from the middle ear. The slightness of the discharge may be accounted for by the blocking of the fistulous tract by granulations. An intracranial complication would probably have developed if the trapped pus had not been evacuated.

GENERAL COMMENT

In both cases a fistula was found above the plane of the horizontal semicircular canal, external to and in front of the superior semicircular canal. In each case the roof of the fistula was removed down to the tip of the apex. The portion removed included most of the anterior surface of the petrous pyramid. It constituted a triangular wedge of cortex which led from the mouth of the fistula to the tip of the apex. The uppermost limit was the posterior superior border, while the lower limit was the upper border of the carotid canal and the greater superficial petrosal nerve. In both cases the cortex and its underlying bone were found to be softened by disease and were therefore readily removed. The dura was gradually elevated in advance of the removal of bone. The elevation of the dura was carried out close to the superior edge. The curet was directed posteriorly so as to avoid contact with the greater superficial petrosal nerve, the middle meningeal artery and the carotid canal. In such operations after the removal of the triangular area of cortex and of the subcortical tissue adjacent to it an overhanging ledge remains. This can be removed with a fine rongeur or a curet. A radical mastoidectomy is not necessary in carrying out this procedure. This is of particular importance in cases in which children are the patients, as their hearing is preserved.

Seydell [2] in his first case encountered a fistula in the subcortical region of the anterior (superior) surface. His procedure, which consisted of removal of the cortex of the anterior surface in the region of the semicircular canals, is the nearest approach to the technic which we have described.

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2. Seydell, E. M.: Surgical Treatment of Suppuration of the Petrosal Pyramid, Ann. Otol., Rhin. & Laryng. **42**:455 (June) 1933.

We agree that enlargement of a fistulous tract, when this is found to exist, frequently causes the lesion to heal. We think, however, that there are a number of cases in which enlargement of a fistula is not sufficient to effect a cure. We therefore advocate removal of the cortex of the anterior surface and of the subjacent diseased bone in cases in which a fistula is found to exist in relation to this surface. We believe that the usual period of convalescence in such cases will be materially shortened and that in some instances the intracranial complications which follow operations for suppuration of the petrous pyramid will be prevented by this procedure.

Roentgenograms taken in the Stenver position enable one to visualize tracts of cells which lie above the level of the arch of the superior semicircular canal. Involvement of these cells is readily recognized in such films. The presence of such a tract of cells on the preoperative film indicates the possibility of a fistula in this region. It suggests the value of a surgical attack such as has been outlined. Loss of definition of the line of the superior surface also indicates this type of surgical treatment.

In an anatomic study which we [3] recently completed it was found that the tracts or groups of cells situated in relation to the anterior surface were the most frequently occurring single group of cells in pneumatized petrous pyramids. Of forty-six well formed channels, fourteen belonged to the anterior surface group. On this basis one would expect a relative frequency of involvement of the subcortical region of the anterior surface.

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3. Myerson, M. C.; Rubin, H., and Gilbert, J. G.: Anatomic Studies of the Petrous Portion of the Temporal Bone, Arch. Otolaryng. **20**:195 (Aug.) 1934.

THE EAR AND CRANIAL TRAUMA

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During the past ten years I have examined 176 patients who had undergone cranial trauma who presented signs or symptoms related to the ear. Practically all the patients have been under observation and have been reexamined from time to time for at least three years, and some are still under observation after the ten year period. Some of the observations have been previously reported in smaller groups as special studies.[1] It is my purpose to report my findings in this group of cases and to emphasize wherein my findings differ from the commonly accepted theories on this subject.

The old classification of fractures into longitudinal and horizontal fractures of the temporal bone has proved of very little help in a clinical study. Therefore, I am offering a substitute classification that seems to include all the types that I have seen. I have divided the cases of cranial trauma with symptoms or signs referable to the ear into the following classes:

1. Cases of fracture involving the external canal only.
2. Cases of fracture involving the middle or inner ear.
3. Cases of patients with symptoms referable to the ear without apparent fracture.

With this classification there is still considerable overlapping, but it seems unavoidable.

Fifteen cases have been observed in which the fracture involved the external canal only, demonstrating that there can be bleeding from the ear without involvement of the structure of the middle or inner ear. In this group there was usually marked swelling at the isthmus of the external auditory canal, although the hearing remained comparatively good, and frequently there was a history of or a demonstrable point of trauma along the horizontal ramus of the mandible. Pain in the region of the temporomandibular joint was common when the mouth was opened, for the condyle of the mandible had been pushed up, fracturing the roof of the glenoid fossa into the canal. In this group it was common to find sequestrums presenting themselves through the

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Read at the meeting of the Pacific Coast Oto-Ophthalmological Society, Butte, Mont., July 16, 1934.

1. Murphy, Albert B.: (*a*) Fracture of the Skull Complicated by Drainage of Spinal Fluid from the Ear, Laryngoscope **41**:237 (April) 1931. (*b*) Evaluation of Vertigo Following Head Injuries, Northwest Med. **32**:25 (Jan.) 1933.

tear in the canal. The sequestrums had to be removed or were expelled spontaneously, particularly if there was superimposed infection. In spite of extensive sequestration of the external canal and often superimposed infection I have been surprised to find that there has never been any evidence of stricture of the canal. When one recognizes a fracture of the external canal one can save the patient considerable worry, as a good prognosis can invariably be given. Likewise, the prediction that there may be chips of bone expelled in from ten days to two weeks helps when it does occur. The removal of sequestrums may be extremely painful, requiring the administration of an anesthetic. Other than the removal of the sequestrums and spreading of the tear to release purulent material in the event of infection, the treatment consists of painting the canal with tincture of iodine and applying the type of dressing used following a mastoidectomy over the auricle. Irrigation or drops in the ear are not used. In my entire group there were no after-effects referable to the ear or to the temporomandibular joint.

At first I planned to separate those cases with involvement of the middle ear from those with involvement of the inner ear, but I found that this was not practicable. I have observed 81 cases in which there was evidence of fracture involving the middle or inner ear or both, including 19 cases in which there was drainage of spinal fluid from the ear. These cases have been studied as to cause, diagnosis, symptoms produced, mode of treatment and prognosis. In 12 cases in which the patient did not recover from the initial shock the observations were necessarily limited.

In the majority of cases in which the point of trauma could be localized it was situated in that quadrant of the skull occupied by the temporal and the occipital bone on the side of the fracture. The degree of trauma varied from that resulting from a simple fall to the sidewalk to that resulting from a fall of 40 feet into the hold of a vessel, head first.

A most significant diagnostic feature is a roentgenogram demonstrating the fracture. However, as I have emphasized before, fractures will be shown in direct relation to the perseverance exerted in attempting to demonstrate them. I demonstrated fractures in the roentgenograms in 56 of the 67 cases, but this was possible only after repeated exposures were made, as I felt certain that there must be a fracture because there was drainage of spinal fluid or some equally positive sign of fracture of the temporal bone. Likewise, in some of the cases included in the third group there was undoubtedly a fracture that could not be demonstrated. I have found, in comparing roentgenograms with autopsy findings, that the roentgenograms rarely show the extent of a fracture of the temporal bone.

As the union in fractures of the temporal bone is fibrous the fracture can be demonstrated by roentgenogram many years after it has occurred. I recently made a roentgen study of a patient I first saw nine years ago, and in comparing the plates with those taken at that time I found that there was no change in the appearance of the fracture.

Extravasation of blood into the temporal muscle, independent of local trauma, with discoloration of the skin over this area is of definite value in diagnosis. Injuries to nerves, such as those evidenced by total deafness, facial paralysis, aphasia and nystagmus, are of help in diagnosis, but it must be borne in mind that any of these can be caused by injury to the substance of the brain without fracture. The Bárány test for viability of the labyrinth and equilibratory division of the eighth nerve is valuable, but it should not be used too soon as an aid in the diagnosis, as there is a possibility of forcing infection inward.

When there is laceration of the membrane of the drum or hemotympanum without laceration and when there are no signs of involvement of the inner ear as evidenced by vertigo or nerve deafness, the fracture may be considered to involve the middle ear only. However, it is unusual to find cases in which one can be certain that the inner ear has not been affected to some degree. Likewise, it is almost impossible to say that symptoms are produced by trauma confined to the inner ear, as identical symptoms can be produced by injury to the nerve tracts leading to it either by direct trauma or by posttraumatic edema. The treatment in this group consists of painting the external canal to the membrane of the drum or to the blood clot, if one is present, with tincture of iodine. A blood clot, if present, is not disturbed beyond the isthmus, and I can see no advantage in swabbing and probing in an attempt to locate the position of lacerations. The entire auricle is then covered with the type of dressing used after mastoidectomy. I describe this routine treatment as the one being used at present without claiming that the incidence of infection will be less than with other commonly used procedures. However, it seems reasonable that better asepsis can be maintained by this procedure than when one trusts that a piece of sterile cotton will remain in place in a patient who is often irrational. Irrigation and ear drops are generally conceded to be detrimental.

Nineteen patients have been observed in whom there was drainage of serous exudate from the ear which was considered to be spinal fluid. Only limited observations were possible on 4 of the patients who did not recover from the initial shock. The diagnosis of drainage of spinal fluid from the ear is not easy to establish, for when the middle ear is traumatized there can be enough reaction in the lining membrane to produce considerable secretion. The amount of fluid secreted is probably the best index. In some cases the amount saturates a wick in one-

half hour, while in others the canal fills under observation. I have been able with the aid of a medicine dropper to collect 20 cc. from the canal in ten minutes.

It is well to remember that a fracture need not extend into the middle ear in order to permit drainage of spinal fluid. I have observed such drainage following operation for exenteration of the gasserian ganglion for trifacial neuralgia, in which some zygomatic cells were entered in the course of exposing the floor of the middle fossa. The fluid seeps down into the middle ear, but it is not certain whether the membrane of the drum was ruptured by the final pressure of fluid or by superimposed infection.

The average duration of drainage of spinal fluid was seven days, the longest being eighteen days, and this was finally controlled by elevating the head of the bed. During the period that increased intracranial pressure is a factor the drainage of spinal fluid acts as a decompressor, and there is no reason for attempting to prevent its flow. On the contrary, it may be advisable to encourage it by elevating the foot of the bed.

Evidence of superimposed infection occurred in 5 of the group of 176 cases, in 3 of which there had been drainage of spinal fluid. In 3 of these cases mastoidectomy was required, and in the others the course was that of acute otitis media. When operation was required a simple mastoidectomy sufficed; the tract of infection led to the mastoid antrum rather than to the line of fracture.

All cases in which there were symptoms referable to the ear or to the nerve tracts without sufficient evidence of fracture have been placed in the third class. However, as I mentioned before, in several of these undoubtedly there were fractures that could not be demonstrated. In this group one is concerned principally with the remote symptoms of deafness, tinnitus, vertigo and injury to the nerve structure, so I shall consider these symptoms in a general way, including observations on all the cases studied.

The 15 cases of fracture of the external canal were lacking in remote symptoms. Of the remaining 161 cases there was total deafness in 18 instances; the deafness has been permanent. In the other cases in which there was deafness, all degrees of nerve deafness were encountered. At times it is difficult to distinguish the deafness of cranial trauma from the boiler-maker type of deafness seen in many industrial workers. Although I have been considering that the degree of deafness present after a period of twelve months is the end-result, it should be remembered that the relation of cranial trauma to the etiology and progress of otosclerosis is being given serious consideration by many otologists. Some have considered that if there is deafness following cranial trauma it must be total. This most emphatically is not true.

Tinnitus in practically all cases runs a course parallel to that of the deafness although it may be more annoying to the patient who is not troubled by a unilateral loss of hearing for high tones.

In considering vertigo following cranial trauma it is necessary to understand which patients are to be considered as suffering from true vertigo, for if only those patients are included who experienced an actual turning vertigo, evidence of a higher percentage of organic lesions will be found. I have included both those with turning and those with tactile vertigo. Included in the group with turning vertigo are all those who had errors of sensation or location in space due to turning, either of themselves or surrounding objects, the principal point being that something turned and moved in a circle. Included in the group with tactile vertigo are those who had sensations of tilting of the surface that they were resting on, such as the floor, bed or chair; those who had a sensation of movement through space in a horizontal plane, and those who had spells during which everything became hazy or black before the eyes but not momentary spells of light-headedness following sudden changes in position.

The following observations are based on a study of 76 patients who complained of vertigo from three months to ten years following cranial trauma. Because it has been felt in the past that the factor of compensation has played such an important part in the prognosis in these patients I have separated the cases in which there was the factor of compensation, of which there were 46, from those in which there was no question of compensation or possible litigation, of which there were 30.

There is a tendency to become overenthusiastic with regard to new tests and procedures. In a paper read before the county society in 1926 on the value of the Bárány test in cases of fracture of the skull involving the temporal bone I left the impression that the problem was pretty well solved and that if the responses to the turning and caloric tests were within normal limits in a patient complaining of vertigo one was dealing with a functional condition that fell into the classification of traumatic psychosis or malingering. Fortunately, the paper was never prepared for publication, for in 1929 [1a] in a published paper I stated that there could be true turning vertigo with a normal Bárány test. Likewise, Grove [2] in 1928, reporting on a group of 30 cases of vertigo including both the turning and the tactile types following injury of the head, stated that of the 30 cases, the irritability of the labyrinths, whether normal, hyperirritable or hypo-irritable, was of unequal intensity in 18 and of equal intensity in 12 cases and that in some of

2. Grove, W. E.: Otologic Observations in Trauma of the Head, Arch. Otolaryng. **8**:249 (Sept.) 1928.

the latter positive findings would have been shown had all the tests been performed by Kobrak's method. He concluded that a difference in the irritability of the two sides was of far more importance in the production of vertigo than hyperirritability and hypo-irritability. However, in 1931,[3] after having examined 300 patients suffering from injuries of the head, he stated positively that true turning vertigo accompanied by spontaneous nystagmus is present in a considerable number of cases in which the most thorough and exacting examination of the peripheral vestibular mechanism revealed it to be functioning normally.

The turning test was carried out on 30 patients. Aside from the shortened duration of nystagmus found in the patients with a completely destroyed labyrinth the variations found were not constant or great enough to be of clinical value.

The results obtained after testing by mass douching and Kobrak's minimal stimulation have been previously reported in detail,[1a] and as the results have not changed materially with a larger number of cases I shall not repeat them. However, it is evident that a normal reaction to turning and caloric stimulation of the labyrinth may be given by a patient suffering from attacks of vertigo and spontaneous nystagmus following injury of the head. Further, when the findings are abnormal they do not constantly show a diminished or increased irritability. Of course, it can be argued that some of the findings can be influenced by supratentorial and subtentorial lesions independent of the vestibular system, but admitting this only adds to the present chaos in evaluating the vertigo.

The tests for irritability of the labyrinth are valuable in determining its viability. In persons with a dead labyrinth or with interrupted tracts from it there is considerable disability even though the other labyrinth does in time compensate. Patients with such a disability are subject to errors of sense of location in space in the dark, and sudden changes of position may bring on an attack of vertigo.

The head movement test was done with the patient seated upright. The head was grasped between the hands of the examiner and moved about to insure relaxation of the muscles of the neck. Then it was held forward 60 degrees for one minute and quickly dropped back so that the face was directed toward the ceiling. The patient was instructed to look to one side as the head was dropped backward, and nystagmus and vertigo were noted. The test was repeated while the patient looked toward the other side. This method of inducing vertigo was called to my attention about seven years ago by a patient who volunteered the information that he could produce the vertigo about which I was questioning him if I wished.

3. Grove, W. E.: The Symptom of Vertigo, Arch. Otolaryng. **14**:177 (Aug.) 1931.

I make no claim to be following any one's technic in performing this test. I have been doing it uniformly, as described, since it was suggested. Nystagmus and vertigo were produced, or the test was positive, in 32 of my patients. This test, when positive, is valuable, for as far as I know it is never positive in normal persons, leaving no question of normal limits to be considered. However, the results vary on repeated examinations, 1 patient giving a positive reaction to the test on nine of seventeen trials, all on different days.

Facial paralysis was present in 4 patients, 3 of whom have recovered completely and 1 partially. One patient who suffered from aphasia has recovered completely. Spontaneous nystagmus was present in 29 cases. Falling, or a positive Romberg sign, was present in 9 cases.

On reviewing the elements in my tests that could be exaggerated or falsified by a too well informed patient who had a desire to malinger, I have not found a great preponderance in the group having an interest in compensation over the group having no interest in compensation. I consider a comparison of the findings in the two groups of more value than a comparison of the actual loss of time from work. Much of the compensation is so arranged that if a man does any work after an injury he definitely damages his case and may entirely cancel his compensation. It should be remembered that these patients are not dizzy all the time and that they are able to do some work between attacks. I had 2 patients who had been working and had been free from symptoms for months who were incapacitated for several days after overexposure to sunlight. Apparently the susceptibility to heat trauma in these patients has not been sufficiently emphasized. Naturally these patients are going to extend their loss of time to cover the periodic exacerbations, so that I consider any comparison based on the length of time from the accident until the patient is able to do any work of very little value.

One must then evaluate the vertigo following injury of the head first from the history, considering carefully the type of injury, the presence and the extent of a fracture and the period of unconsciousness following the injury. While it is true that occasionally a slight injury will cause an extensive fracture or a severe concussion, in general the more severe the injury the greater chance there is of after-effects, and the after-effects are generally of more consequence in those who have a long period of unconsciousness following the injury. The treatment received at the time of injury is important, for those who are kept in bed and dehydrated with the pressure relieved by spinal puncture have fewer after-effects, as do those who avoid the use of alcohol, exposure to heat and constipation during convalescence. I consider the patient's own description of the vertigo of inestimable value. If he describes without the aid of leading questions attacks of vertigo of the turning or

tactile type there is little doubt as to the presence of true vertigo, for in my experience I have found few malingerers who could describe these typical phenomena.

With the careful studies that are being published, I believe that ground is being gained all the time in the diagnosis, treatment and evaluation of disability in these cases. The tests for irritability of the labyrinth and all the other neuro-otologic tests should be carried out and the findings carefully compiled and compared. However, every one has seen the popularity of the turning and caloric tests in the localization of tumor of the brain rise, only to fall again. Likewise, in aviation medicine these tests were hailed with immature enthusiasm, and many prospective aviators were rejected on that basis. Fenton [4] in a recent article said that the vestibular function no longer holds the commanding position in aviation that it did during the last war. He quoted from a circular of the Royal Air Force as follows: "As a result of the examination of first grade pilots by the Bárány tests, it was found that the re-actions to rotation might be excessive in some individuals and diminished in others, but in neither case did the re-actions of the vestibular apparatus seem to indicate an airman's probable flying ability."

I do not feel that my series is large enough to claim that the vestibular tests are of value only in determining the viability of the labyrinths, but I do feel that the tests should be limited to this as far as the question of compensation is concerned in evaluating vertigo following injury of the head.

CONCLUSIONS AND SUMMARY

A group of 176 cases of cranial trauma has been studied.

The susceptibility of patients suffering from cranial trauma to head trauma has not been sufficiently emphasized.

The preponderance of symptoms that lend themselves to exaggeration was not greater in the group having compensation than in those not receiving compensation.

One should be conservative in interpreting the neuro-otologic findings in terms of percentage loss of function.

315 Medical and Dental Building.

4. Fenton, R. A.: Otolaryngologic Aspects of Commercial Aviation, Ann. Otol., Rhin. & Laryng. **40**:1070 (Dec.) 1931.

SYNDROME OF DIPLACUSIS AND NERVE DEAFNESS FOR LOW TONES

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The determination of the etiology of deafness due to obstruction to the conduction of sound is a comparatively simple matter to one skilled in the use of the differential tuning fork tests and experienced in the clinical course and diagnosis of the conditions which may cause deafness based on poor conduction. On the one hand are the cases of catarrhal or suppurative otitis media in which the defect in hearing is not progressive except during the active stage, i. e., an acute tubal occlusion with fluid in the middle ear or a purulent discharge from a perforation in the drum membrane. On the other hand are the cases of spongification of the labyrinthine capsule (otosclerosis) with primary fixation of the stapes and progressive deafness in which the drum membrane is entirely normal or shows slight scarring or thickening, the residues of otitis media in childhood unrelated to the present trouble.

The determination of the etiology of nerve deafness is a more difficult problem in many cases because the inner ear cannot be looked at with an ophthalmoscope or an otoscope as can the eye and the middle ear, and one must rely on circumstantial evidence to indicate the location, the type and the cause of the pathologic condition.

If the patient has syphilis, a fractured skull or evidences of acoustic neuroma the etiology is clear. If there is associated suppurative otitis media or the clinical picture of spongification of the labyrinthine capsule, the associated secondary degeneration of the nerve seen in any long-standing case of suppurative otitis media and sooner or later in all cases of otosclerosis will account for the superimposed nerve deafness. If the nerve deafness occurs abruptly during an acute systemic infection, such as influenza, scarlet fever, measles, pneumonia, typhoid fever or mumps, the defect is on a toxic basis which tends to improve during the first few weeks of convalescence and then remains stationary. Rarely the patient with nerve deafness shows definite evidences of myxedema, and with thyroid extract the hearing improves. Occupational nerve deafness must be suspected in boiler makers, riveters,

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Read before the Indiana Academy of Ophthalmology and Otolaryngology at Indianapolis, April 10, 1935.

operators of pneumatic drills and aviators. The most frequent cause of primary nerve deafness is, of course, the senile change which can be demonstrated in every one past the age of 40 as a beginning loss of hearing for notes above 13,000 double vibrations.

In a considerable proportion of cases of nerve deafness coming on too early in adult life to be considered senile the patient is in good health except for the defective hearing; the reaction to the Wassermann test is negative; the middle ears are in normal condition; there is no family history of deafness or history of trauma or exposure to excessive noise, nor was the onset related to acute infection of any kind. Hearing tests show a clearcut picture of inner ear deafness with a positive reaction to the Rinne test, hearing in the better ear in the Weber test and a shortened duration of bone conduction in the Schwabach test. The rotation and caloric tests may or may not show a diminished response.

It is in these cases of primary nerve deafness of doubtful etiology that I have been able to separate a distinct group in which the symptoms of diplacusis and nerve deafness for low tones are shown and in which the etiology, pathology and prognosis differ from those in the usual cases of primary nerve deafness.

Diplacusis binauralis dysharmonica is the condition in which the same sound has a different pitch when heard by one ear than when heard by the other. According to the Helmholtz theory of hearing each tone in the scale stimulates its own group of hair cells in the cochlea, and its own nerve fibers in the eighth nerve transmit the impulse to the brain (fig. 1). Injury to the eighth nerve or to the acoustic tracts in the brain may destroy or diminish the intensity with which a tone is heard but cannot in any way change the quality or pitch at which it is heard. On the other hand, a lesion in the cochlea, such as an inflammatory exudate clinging to the vibrating membrane, may alter the phase of vibration of this membrane so that a different area now responds to a certain tone, and since a different group of hair cells and nerve fibers are stimulated, a different tone is heard by the brain. A tone of 64 vibrations, for example, is now heard in the diseased ear as a tone of 96 vibrations or as an impure or rough sound, while in the opposite normal ear it is still heard as the pure tone of 64 vibrations (fig. 2). If the Helmholtz theory of hearing is correct, diplacusis indicates a pathologic change in the labyrinth rather than in the eighth nerve. Is one justified, however, in assuming that the Helmholtz theory of hearing is correct?

A few years ago it seemed as though the experiment carried out by Wever and Bray at Princeton University had invalidated the Helmholtz theory of hearing. In this experiment electrodes attached to the amplifier of a vacuum tube were placed on the exposed eighth nerve

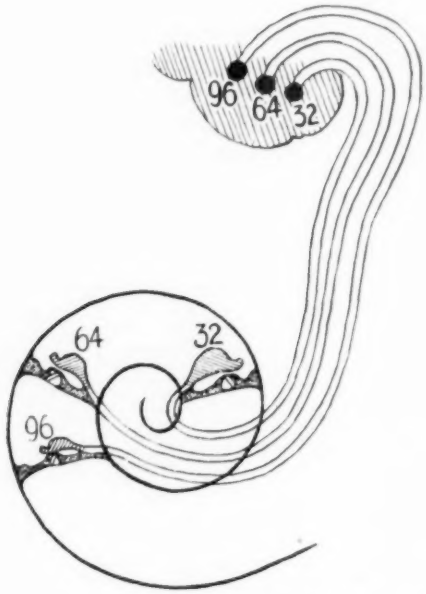

Fig. 1.—Each tone stimulates a different area in the cochlea and a definite set of nerve fibers which transmit the impulse to the auditory center in the brain.

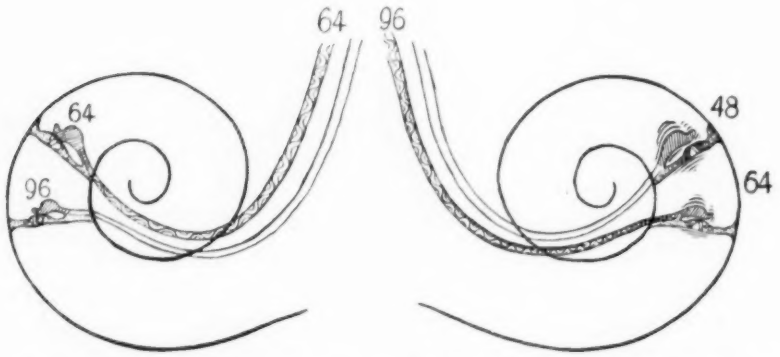

Fig. 2.—In the normal ear the note of a fork of 64 double vibrations stimulates its special portion of the organ of Corti and its set of nerve fibers. In the affected ear the vibrating membrane has been altered so that the area which previously responded to the fork of 96 double vibrations now responds to that of 64 double vibrations, the tone of the latter fork being heard in the brain as one of 96 double vibrations.

of an anesthetized cat. Words spoken into the cat's ear were accurately reproduced by the amplifier in an adjoining room. The logical interpretation of this experiment seemed to be that sound is transmitted unchanged to the brain, the analysis of sound occurring not in the cochlea, as Helmholtz believed, but in the brain. This interpretation, however, could not be harmonized with what is known concerning the physiologic action of nerve fibers, since the maximum number of responses per second which can be transmitted by a neuron of the size found in the eighth nerve is about 1,000, while the normal ear can hear sounds of more than 15,000 vibrations per second.

Recent experiments by Davis, Derbyshire and Lurie at Harvard University offer for the first time a satisfactory explanation for the Wever-Bray phenomenon. These authors, using a set-up similar to that employed by Wever and Bray, found that when the electrodes are placed on the eighth nerve with tones of as high as 600 or 800 vibrations per second there is only the slight fatigue familiar in other nerves. With tones of slightly higher frequency approaching the theoretical maximum of 1,000 vibrations per second that can be transmitted by nerve fibers, the fatigue is much more rapid. With tones of 1,200 vibrations, however, the diminution from fatigue is again slight, but the loudness of the response is one-half that obtained with the lower tones. The authors concluded that because the maximum response of these nerve fibers is in the region of 1,000 vibrations per second the fibers were then responding to every second stimulus, so that only one-half the number of fibers responded to each sound wave. This phenomenon is comparable to a 2:1 heart block. Theoretically, with tones of about 2,400 vibrations the response should be still weaker, corresponding to a 3:1 pattern of response, and that is just what occurs. The authors concluded that the analysis of tone occurs, after all, in the cochlea, since with frequencies above 1,000 the response of the fibers of the auditory nerve falls to one-half, owing to a 2:1 pattern of response, yet no subjective change is observable in the pitch of the tone. The presence of the stimulating frequency in the response of the auditory nerve to low tones is merely an incidental relationship resulting from the intermittent nature of the stimulus. For example, the tone of 64 vibrations stimulates the hair cells in a certain area of the organ of Corti 64 distinct times per second, and 64 distinct nerve impulses are transmitted along the auditory nerve by the nerve fibers coming from the area which responds to this tone near the apex of the cochlea.

The recent work of Crowe and Guild on the pathologic changes involved in deafness for high tones also definitely confirmed the Helmholtz theory of the peripheral analysis of sound. These workers determined that the tone of 8,192 vibrations was heard in the region from

4 to 5 mm. from the basal end of the human cochlea; the tone of 4,096 vibrations, in the region from 7 to 9 mm. from the basal end, and that of 2,048 vibrations, in the region between 9.5 and 12 mm. from the basal end. With this confirmatory physiologic evidence it can be said with increased certainty that the symptom of diplacusis indicates a lesion in the cochlea which has altered the phase of vibration of the vibratory membrane. Since there have been no postmortem examinations in cases of diplacusis, one can only surmise that the lesion is probably inflammatory in nature and that the vibrating membrane is weighted down by an inflammatory exudate, just as a piece of gum placed on the string of a piano changes its vibratory rate. In the absence of suppurative otitis media this inflammation may be the result of blood-borne toxins or of infection, perhaps comparable to iritis in the eye.

Three patients showing the syndrome of nerve deafness for low tones and diplacusis were seen in the course of a year.

REPORT OF CASES

CASE 1.—Mr. W. R. W., aged 42, was seen on Nov. 8, 1933, complaining of roaring in the left ear of two weeks' duration and a slight defect in hearing for a few days. He had noticed that orchestras seemed out of tune and had had mild attacks of dizziness for about five years with a tendency to unsteady gait during the attacks.

The drum membranes were normal in appearance.

Rotation tests elicited nystagmus lasting sixteen seconds in each direction.

The results of the tuning fork tests were as follows:

Test	Right Ear	Left Ear
Whisper	3.5 meters	2 feet (0.609 meters)
Fork of 32 double vibrations	Normally heard	Not heard
Fork of 64 double vibrations	Normally heard	Duration moderately shortened
Forks of 2,048 double vibrations	Duration very slightly shortened	Duration very slightly shortened
Weber	Heard forks of 108 and 128 double vibrations	Not heard
Rinne	Positive	Positive
Schwabach	Normal	Normal

Distinct diplacusis was noticed, most marked for low tones, which appeared to be lower in pitch and poorer in quality in the left ear.

A diagnosis was made of exudative labyrinthitis involving the left ear with weighting down of the vibrating membrane.

Search for focal infection revealed that the sinuses and teeth were in normal condition but that there was a history of many attacks of severe tonsillitis. The tonsils were reddened and enlarged, and the cervical glands were palpable. The

patient stated that two weeks before the onset of the deafness he had a sore throat and cervical adenitis on the left side. The Wassermann test of the blood gave a negative reaction, and the results of a complete physical examination were otherwise normal.

Tonsillectomy was advised and carried out on November 17. Six weeks later dizziness had not recurred; the defect in hearing had entirely cleared up, and orchestras now sounded in tune. Hearing tests showed that the whisper was heard at 4 meters from each ear; the forks of 32 and 64 double vibrations were heard normally in both ears, and the Weber test was not lateralized. Diplacusis could no longer be demonstrated (fig. 3*B*).

A year and a half has now passed with no recurrence of the aural symptoms, and attacks of dizziness, which had previously appeared at frequent intervals over a period of five years, have not returned.

CASE 2.—Mr. R. B. C., aged 56, was brought into my office on May 24, 1934, supported between two men, too dizzy to stand. His trouble began abruptly three

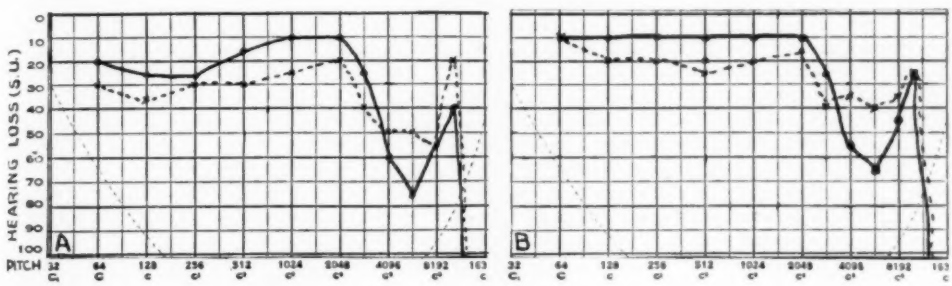

Fig. 3.—Audiograms obtained from the patient in case 1. In these audiograms and in those in figures 4 and 5 the audiometric reading for the right ear is indicated by a solid line, that for the left ear, by a broken line, and the total loss of serviceable hearing, by the parabola. The horizontal line at *0* indicates the level of normal hearing. Audiogram *A* was obtained on November 8 and *B* on June 18, seven months after tonsillectomy. The patient had been an aviator during the World War, which accounts for the marked depression of hearing in the region of the upper tones.

months before with an attack of dizziness accompanied by nausea and vomiting and ringing and defective hearing in the right ear. The dizziness lasted all day and then cleared up, but the tinnitus and partial deafness persisted. Three days before coming to the office he experienced the second attack of dizziness lasting several hours with nausea and vomiting. On the morning of his visit as he came down to breakfast, the third attack of dizziness occurred. There were a tendency to fall to the right, a sensation of turning to the right, vomiting and increased ringing in the right ear.

At the time of examination he was still dizzy, pale and nauseated with occasional vomiting. Spontaneous nystagmus to the left was present. The drum membranes were normal except for thickening and loss of luster. The eustachian tubes were normally patent.

With the caloric tests a response was obtained from the left ear in forty-eight seconds and from the right (affected) ear in one minute.

The tuning fork tests gave the following results:

Test	Right Ear	Left Ear
Whisper	Heard close to ear	Heard at 2 meters
Fork of 32 double vibrations	Scarcely heard	Normally heard
Fork of 64 double vibrations	Duration slightly shortened	Normally heard
Fork of 2,048 double vibrations	Duration slightly shortened	Normally heard
		Hearing referred to the left ear with a fork of 108 double vibrations
Weber		
Schwabach	Normal	Normal
Rinne	Positive	Positive

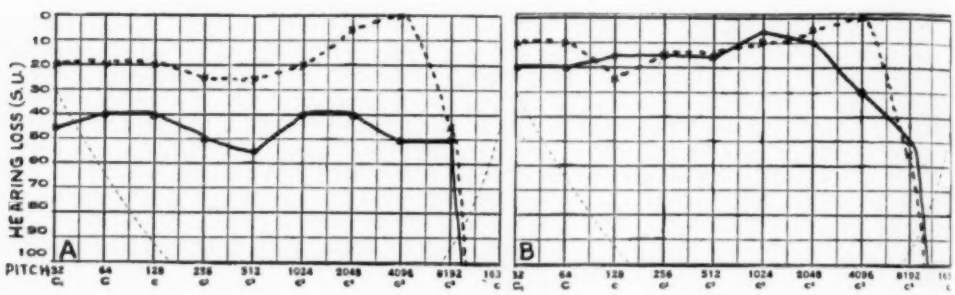

Fig. 4.—Audiogram *A* was obtained from the patient in case 2 on May 25, and *B*, on June 7, about one week after tonsillectomy.

Distinct diplacusis was present for tones of the forks of low pitch, which were heard in the right ear as tones of higher pitch and harsher qualities.

A diagnosis was made of Ménière's syndrome with inner ear deafness due to exudative labyrinthitis and weighting down of the vibrating membrane.

Search for possible foci of infection revealed small but submerged and reddened tonsils, from one of which a drop of pus was expressed. Tonsillectomy was advised and carried out a week later, on May 31, 1934. One week after operation the tinnitus and deafness, constantly present for three months, had entirely cleared up. The whispered voice was heard at 4 meters in both ears, and all the forks were heard normally in both ears (fig. 4 *B*). Diplacusis, however, was still present. The patient returned six months later for a reexamination. He had had no more attacks of vertigo or tinnitus, and his hearing was normal. The diplacusis had disappeared.

Case 3.—Mr. W. B. S., aged 57, was seen Nov. 14, 1934, complaining of dizziness which had first been noted six days before his visit and which had since been present intermittently with definite ataxia, nausea and vomiting on one occasion. He was not conscious of tinnitus or deafness, but the tuning fork tests showed a

definite loss of hearing for the low tones in the right ear. Results of the hearing tests were as follows:

Test	Right Ear	Left Ear
Fork of 32 double vibrations	Scarcely heard	Duration very slightly shortened
Fork of 64 double vibrations	Distance shortened	Normally heard
Weber	Not lateralized	Not lateralized
Schwabach	Bone conduction shortened	Bone conduction shortened
Rinne	Positive	Positive

Definite diplacusis was present, the forks of 32 and 64 double vibrations being heard at a higher pitch in the affected ear.

A diagnosis of exudative labyrinthitis was made.

Careful search for focal infection in the nose and throat gave negative results, but the patient was convalescing from a prostatectomy complicated by cystitis, for which he was still under treatment. A few hours before the dizziness began he

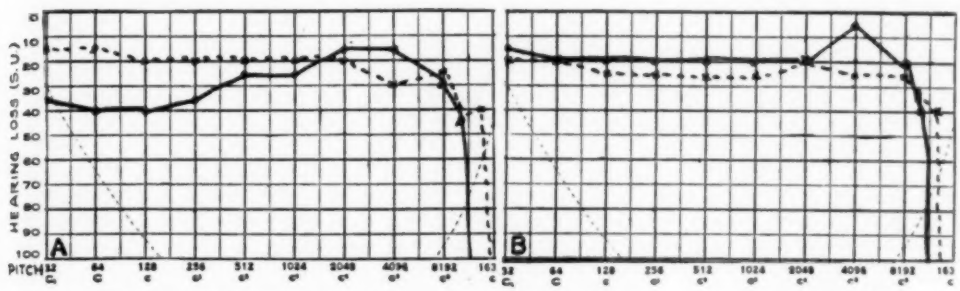

Fig. 5.—Audiogram *A* was obtained from the patient in case 3 on November 14, and *B*, on December 5, about three weeks later.

had played eighteen holes of golf, the first vigorous exercise since the prostatectomy. The labyrinthitis was possibly the result of the infection of the bladder exacerbated by overexertion. Rest was advised, and with the two other cases in mind a good prognosis was given.

Three weeks later the hearing for the tuning forks was distinctly improved, and there had been no further dizziness (fig. 5*B*). Seven weeks later the hearing was normal without diplacusis, and there had been no more dizziness.

In addition to the symptom of diplacusis these three cases of Ménière's syndrome were unusual in the fact that the hearing recovered and in the type of nerve deafness found. In each case the hearing for low tones was more impaired than that for high notes, the upper limit of hearing being normal for a person of the patient's age. This deafness for low tones was clearly due to a defect of the inner ear with shortened bone conduction, a positive reaction to the Rinne test and the forks in the Weber test heard in the normal ear. If my surmise is correct that the lesion is an inflammatory exudate weighting down the vibrating membrane, this exudate might be expected to cling to the

coarser, broader membrane responding to the low tones as much as, or even more than, to the smaller, finer portions responding to the high notes.

It must be noted that the factors in only one of the three cases are sufficiently controlled to permit conclusions. The first patient, for example, had been deaf for only two weeks and might have recovered without a tonsillectomy, although he had had mild attacks of vertigo for five years which entirely disappeared after tonsillectomy. In the second case, however, there had been three severe and characteristic attacks of Ménière's syndrome over a course of three months, and for three months the patient had been partially deaf with constant tinnitus. It seems more than a coincidence that the removal of a focus in the tonsils was followed by rapid recovery in hearing, disappearance of tinnitus within a week and more gradual disappearance of diplacusis.

One must, of course, be guarded in his deductions from so small a series of cases, but the following conclusions seem to be justified: If the Helmholtz theory of hearing is essentially correct, as recent work indicates, diplacusis indicates a lesion in the labyrinth altering the phase of vibration of the vibratory membrane, and this lesion is probably inflammatory in nature with weighting down of the vibrating membrane by a fibrinous or cellular exudate. In a case of primary nerve deafness involving particularly the low tones and exhibiting the symptom of diplacusis, exudative labyrinthitis should be suspected, and any definite focus of infection should be removed. In three patients showing this syndrome the hearing returned to the normal state after the removal of a definite focus of infection.

122 South Michigan Avenue.

NONCANCEROUS EPITHELIAL TUMOR OBSTRUCTING THE BRONCHUS OF THE UPPER LOBE OF THE LEFT LUNG

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REPORT OF A CASE

P. B., a woman 23 years old, a clerk, was admitted to the Beth Israel Hospital for the first time on Nov. 22, 1933, complaining of pain at the angle of the left scapula and intermittent fever of nine months' duration. She had always been well except for "pneumonia" nine years before. Nine months before admission she had a severe chill accompanied by high fever and cough. The cough was productive of a moderate amount of sputum, which was not odorous and never blood tinged. Accompanying the attack she had severe lancinating pain in the left side of the chest and left axilla which was made worse by breathing. Her temperature ranged from 102 to 105.5 F. This episode lasted three weeks and gradually subsided. Since that time she had had similar episodes of chilliness, fever and thoracic pain and cough, recurring at intervals of about six weeks and lasting about two weeks. During the intervals she had a low grade fever (temperature from 99.8 to 100.1 F.). Her last attack began two weeks before admission and had not subsided when she was admitted to the hospital.

Physical examination on admission gave negative results except for those in the chest. Over the upper lobe of the left lung anteriorly and posteriorly percussion revealed dulness to flatness with distant breath sounds and decreased vocal fremitus. No râles were heard.

The temperature on admission was 100 F., the pulse rate was 86 and the respiratory rate, 24. The blood pressure was 130 systolic and 80 diastolic. A blood count showed: hemoglobin, 90.5 per cent, 4,040,000 red cells and 12,950 white cells, with 76 per cent polymorphonuclears and 24 per cent mononuclears with 8 per cent staff cells, 64 per cent segmented cells, 2 per cent basophils, 2 per cent eosinophils, 21 per cent lymphocytes and 3 per cent monocytes. The sedimentation rate was 68 per cent; the Wassermann test was negative, and the urine was normal.

Fluoroscopic examination and roentgenograms on November 23 indicated a large area of diminished aeration in the lower portion of the upper lobe of the left lung. The heart and mediastinal contents were shifted to the side of the lesion. The intercostal spaces were retracted. These findings suggested an area of atelectasis due to bronchostenosis of the upper lobe of the left lung.

Bronchoscopic examination two days later revealed a soft tumor blocking the entrance to the bronchus of the upper lobe of the left lung. Almost all the mass corking the lumen was removed. After its removal white creamy pus came from the upper lobe. Another bronchoscopic examination was advised in several weeks.

Bacteriologic examination of the pus obtained on bronchoscopy revealed streptococci, Vincent's organisms, staphylococci and diphtheroid bacilli. Examination

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From the medical service of Dr. Albert A. Epstein.

of the sputum revealed similar organisms. Repeated examinations of the sputum for tubercle bacilli gave negative results.

Pathologic examination revealed an epithelial tumor of the bronchus, histologically malignant and clinically generally benign.

A roentgenogram taken three days following bronchoscopy (on November 28) showed partial retraction of the upper lobe of the left lung and a small amount of air in the pleural cavity. The aeration of the retracted lung was normal. The heart and mediastinal contents were still somewhat retracted to the left.

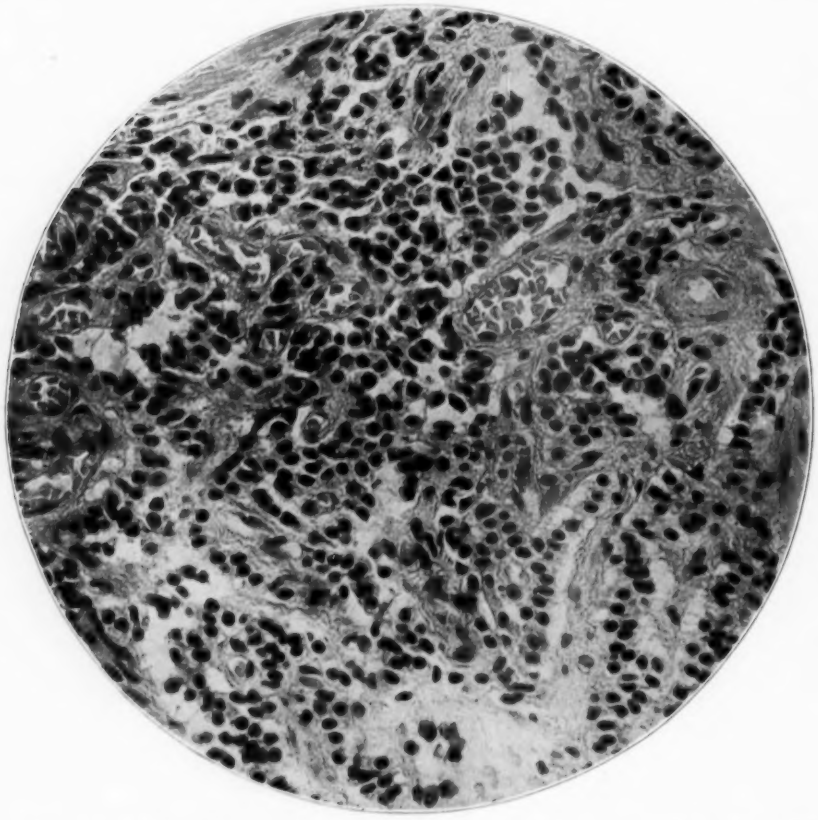

Fig. 1.—A photomicrograph of a section of an epithelial tumor of the bronchus, showing the cells in rows without distinct glandular arrangement and with many blood vessels.

A roentgenogram taken twelve days after bronchoscopy showed a small amount of air in the left pleural cavity and the lung partially retracted. The heart and mediastinal contents were still retracted to the left.

On December 9, two weeks after the first bronchoscopy, a second bronchoscopy was done in order to remove the remaining tumor tissue. The bronchoscope was pushed into the main bronchus on the left and was then again turned to the upper lobe of the left lung. Here a large soft mass was found protruding from the lobe. This was grasped with forceps and removed piecemeal.

Two days later a roentgenogram showed considerable retraction of the left lung due to the presence of air in the pleural cavity. The upper lobe was considered possibly the seat of bronchiectasis.

The course following the first bronchoscopy was one of steady improvement. The signs in the chest gradually cleared, and on discharge there was only a slight dulness over the upper lobe of the left lung with normal breath sounds. The temperature, which ranged between 99 and 100.8 F., gradually fell to normal. The

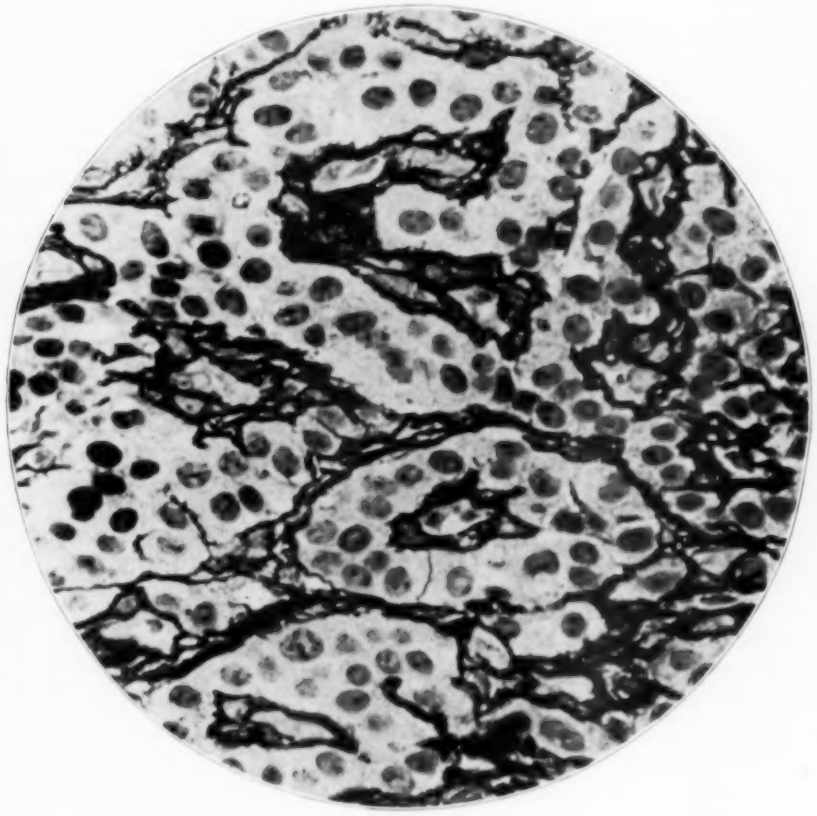

Fig. 2.—A photomicrograph demonstrating that the tumor cells did not form fibrils; silver (Bielschowsky) stain.

patient was discharged on December 18 with a diagnosis of polyp of the bronchus of the left lung and possible bronchiectasis.

The report by Dr. Alfred Plaut of the pathologic examination of the specimen obtained at the second bronchoscopy was as follows: The diagnosis was the same as on the previous report. About two thirds of the material consisted of blood, fibrin, mucus and necrotic tissue. There was one round polyp-like piece about the size of a small pea. It was mostly covered with squamous epithelium. The epithelium was edematous, and the intercellular bridges were distinct. The uppermost layers were flat. There was no hornification. Leukocytes were scattered

throughout the epithelium. The basal layer was irregular. There were many mitotic figures in the lower layers. The cells in these layers were spindle-shaped and had large nuclei. Mitotic figures were seen. The stroma of the polyp was partly fibrous, partly edematous, hemorrhagic and severely inflamed. Hemosiderin was present. Near the surface the stroma was permeated by single strands of cells which were different from the surrounding tissue by their medium to small, dark, ovoid nuclei in rather close juxtaposition. These cells had a tendency to arrange themselves in single rows after the fashion of epithelium. The rows were situated in the tissue spaces in such a way that generally a blood vessel separated two such epithelium-like rows. No glandular structures were seen. The bulk of the tumor appeared as a more or less irregular agglomeration of the cells just described. There was little variety in size and staining characteristics of protoplasm and nuclei. One small piece which was separate from the remaining tissue gave a distinctly papillary structure, with the rows of cells lining a thin stroma which consisted mainly of the walls of blood vessels. Most of the cells were only a little higher than the nuclei. No basal membranes could be seen. There seemed to be no connection between the tumor and the surface epithelium. The tumor, however, was situated very near the surface. Other pieces consisted of the bronchial wall with cartilage and more or less distended bronchial glands. Further study of sections prepared with Van Gieson's, Mallory's and Bielschowsky's stains confirmed the observations already given. The thick fibers which were seen with the Bielschowsky stain belonged to the walls of the blood vessels. Fragments of partly thick, partly thin fibers were seen in places where the blood vessels were few in number. It is highly probable that these fragments of fibrils were remnants of the broken-up stoma. The tumor obviously had no fibrils of its own. In other areas, where the single rows of tumor cells were cut at a right angle, single cells appeared surrounded by fibers. Parts of the tumor which adjoined the polypoid, edematous protrusion seemed to be destroyed by the edema. With the polychrome methylene blue stain the nuclei of the tumor became much darker than those of the surrounding tissue. The mucicarmine stain gave negative results.

I wish to refer the reader to a report by Dr. David Reisner [1] of a case of intrabronchial polypoid adenoma. His review of the literature is so thorough and the accompanying list of references is so complete that it would be a waste of time and space to go over them once more.

305 East Seventeenth Street.

1. Reisner, David: Intrabronchial Polypoid Adenoma, Arch. Surg. **16**:1201 (June) 1928.

SURGICAL APPROACHES TO DEEP SUPPURATION IN THE NECK AND POSTERIOR MEDIASTINUM

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CINCINNATI

In his classic treatise entitled "Topographical Anatomy," published in 1887, Tillaux stated that the cervical fascia is an exceedingly variable structure and that this variability explains a certain confusion or difference in the descriptions of various authors. It was Tillaux's chief endeavor to present a description of the cervical fasciae which would harmonize with the recognized pathologic conditions of the neck. About forty years later Tandler,[1] after mentioning the complicated arrangement and interrelations of the various structures of the neck, pointed out that this very complexity led to the most divergent descriptions and interpretations by various anatomists.

The cervical fascia is usually described as consisting of three layers —a superficial or investing, a middle or visceral and a deep or prevertebral layer. The first or outer layer completely surrounds the neck and is attached to the skull and mandible above and to the clavicles and sternum below. The second or visceral layer invests the larynx and trachea in front and extends laterally and posteriorly to include the pharynx and esophagus. It splits to embrace the thyroid gland. The visceral layer is attached to the base of the skull above and behind and is continuous with the mediastinum below. If the cervical viscera are removed from a cadaver a space remains which is known as the viscereal compartment. The third or deepest layer, known as the prevertebral fascia, extends across the neck immediately in front of the vertebral column and unites laterally with the two other layers. At the point at which the three layers come together they form a so-called sheath for the great vessels of the neck, the perivascular sheath.

Certain spaces exist between the fascial lamellae. The important visceral compartment has already been mentioned. The loose areolar tissue between the pharynx and esophagus in front and the prevertebral fascia behind constitutes the postvisceral space. The previsceral or interaponeurotic space is situated between the trachea behind and the sternohyoid and sternothyroid muscles in front.

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Read before the meeting of the Middle Section of the American Laryngological, Rhinological and Otological Society, Indianapolis, Jan. 23, 1935.

1. Tandler, J.: Lehrbuch der systematischen Anatomie, Leipzig, F. C. W. Vogel, 1923.

Recent studies by Weintraub [2] and Batson [3] present a new interpretation of the anatomic relations and structure of the cervical connective tissues. These authors considered the neck as made up of two parts—the cervix proper, i. e., the cervical vertebrae together with the postvertebral muscles, and, second, the gula or visceral parts of the neck with their associated muscles, blood vessels and nerves. The visceral part of the neck is of especial interest to the surgeon. Dr. Weintraub [4] demonstrated the technic of the anatomic dissection on which the study of this portion is based. The head and neck are split in the middle line, and transverse sections of the neck are also made. The tissues are not dissected but are merely teased apart beginning at the spinal column. This method demonstrates that the connective tissues of the neck are arranged in two groups, one of which is termed pedicles and the other telae, or weblike tissue spaces.

The pedicles consist of sheets or lamellae containing the supply of blood vessels and nerves to the structures in which they terminate. The pedicles may be likened to the mesenteries of the abdominal viscera. The chief cervical pedicles originate from the neurovascular bundle, from which in transverse section they are seen to radiate in a manner similar to that of the ribs of a folding fan. The neurovascular bundle, or hinge of the fan, has the form not of a conduit but of a nutrient stalk. The telae, represented by the webbing of the fan, consist of loose areolar tissue lying between the various pedicles and are coextensive with the so-called tissue spaces of the older anatomists. There are no macroscopic blood vessels within the telae. The telae are best developed in the areas in which the adjacent structures, for physiologic reasons, require the greatest freedom of movement. The technic of blunt separation discloses numerous spaces not demonstrable in ordinary dissections. For examples, the so-called retropharyngeal space consists not of one but of three distinct compartments—one large median compartment and a juxtamedian space on each side. A potential space also exists between the anterior spinal muscles and the prevertebral fascia on each side and continues downward behind the dome of the pleura (figs. 1 and 2). In addition, the mucous membrane on the posterior wall of the pharynx can be elevated, disclosing two submucous spaces separated from each other by the median raphe (fig. 1, *4*).

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2. Weintraub, J.: The Loose Telae and Pedicles in the Neck, Anat. Rec. (supp. 1) **52**:42 (Feb. 25) 1932.

3. Batson, O. V.: Personal communication.

4. The dissections represented by figures 1 and 2 were made by Dr. Weintraub. The dissections and the terminology employed to designate the spaces are based on the as yet unpublished work which was presented on March 25, 1932, at the meeting of the American Association of Anatomists at Columbia University, New York.

Another space is located between the trachea and the esophagus, and two telae lie between the depressor muscles of the larynx. A knowledge of these additional spaces or telae is of considerable value in the study of infectious processes in the neck.

Fig. 1.—Median section showing the left half of the head and neck. *1* indicates the left prevertebral space; *2*, the median postvisceral space; *3*, the left posterior peripharyngeal space; *4*, the pharyngeal submucous space; *5*, the muscle of the posterior wall of the pharynx; *6*, the esophagotracheal space; *7*, the trachea; *8*, the larynx; *9*, the torus tubarius with the ostium, and *10*, the tongue.

DEEP INFECTIONS

Abscesses or suppurations develop within the telae and are limited by the pedicles, which one must either separate or perforate in approach-

ing and draining the infected areas. Suppurative disease may, of course, break through the pedicles and extend from one tela to another. In this connection, I have demonstrated on the fresh cadaver the retropharyngo-esophageal pathway of infection by packing the postvisceral compartment with lead gauze introduced into it either from above or from below. The gauze is demonstrable in the roentgenogram, and it also delineates the space in vertical or horizontal sections of the frozen specimen. In figure

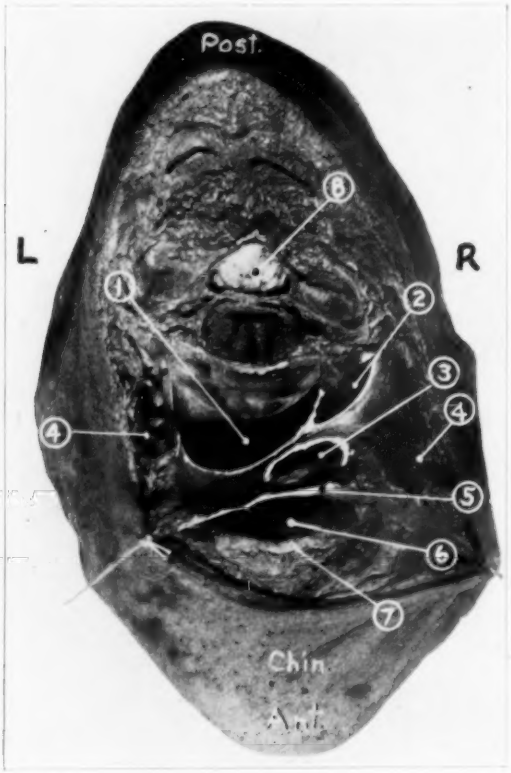

Fig. 2.—Horizontal section through the neck at the level of the body of the fourth cervical vertebra, seen from below. *1* indicates the median postvisceral space; *2*, the right prevertebral space; *3*, the right posterior peripharyngeal space; *4*, the neurovascular bundle; *5*, the muscle of the posterior wall of the pharynx; *6*, the cavum pharyngis; *7*, the epiglottis, and *8*, the spinal cord. Spaces on the left side corresponding to spaces *2* and *3* have not been opened.

3 the gauze pack is shown in place, and the vertical pathway from the base of the skull into the posterior part of the mediastinum is demonstrated. It is evident in figure 4 that the lateral limits of the pathway are formed by the neurovascular bundle.

In addition to the present improved understanding of the anatomic relations of the neck and the usual methods of physical examination, there are two aids in the diagnosis of the presence and in the determination of the site and extent of infections of the neck. I refer to the use of the roentgenogram and of the esophagoscope. By means of roent-

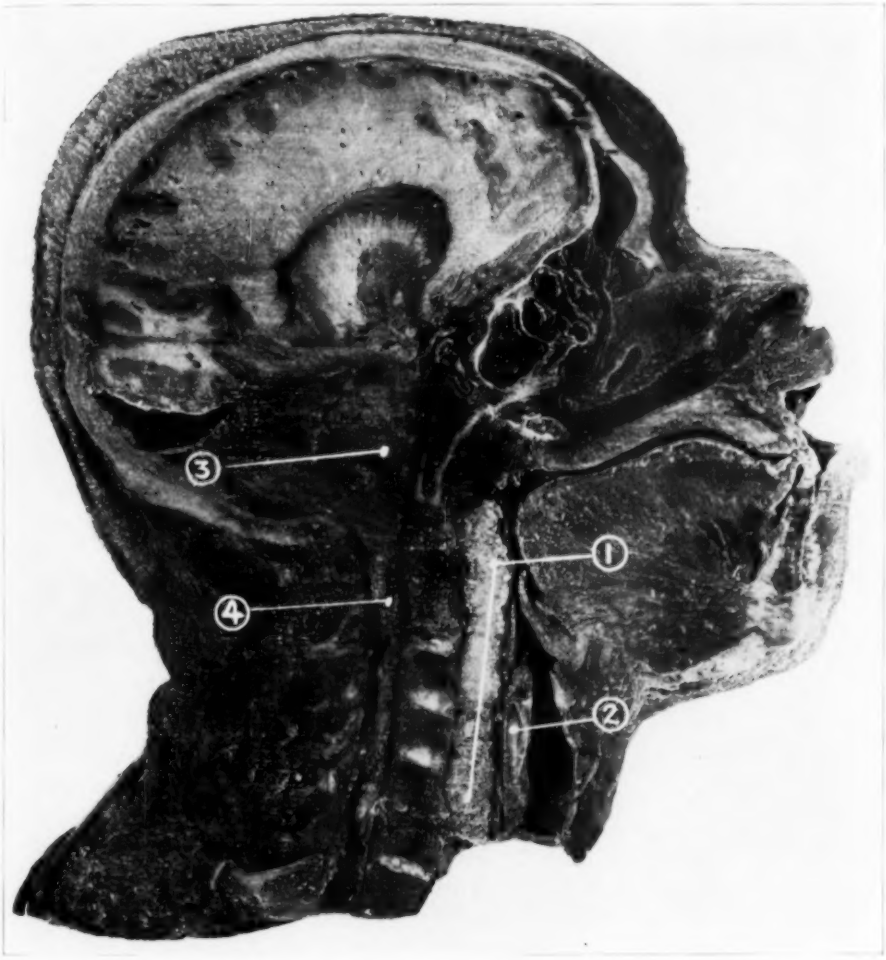

Fig. 3.—Median frozen section showing the left half of the head and neck of an adult. *1* indicates the gauze pack in the postvisceral space; *2*, the cricoid cartilage; *3*, the brain stem, and *4*, the spinal cord. The space filled by the gauze pack corresponds to space *2* in figure 1 and to space *1* in figure *2*.

genograms taken in the lateral and anteroposterior positions the swelling can usually be delineated both in the neck and in the mediastinum. In perforation of the esophagus interstitial emphysema about the site of

perforation can also be demonstrated on the film, even when emphysematous crackling is not palpable at the root of the neck (Iglauer and Ransohoff [5]). If the patient is given iodized poppy-seed oil to swallow the opaque oil may pass through the perforation and appear outside the esophagus.

The introduction of an esophagoscope will reveal the site of greatest swelling as well as the presence or absence of a perforation.

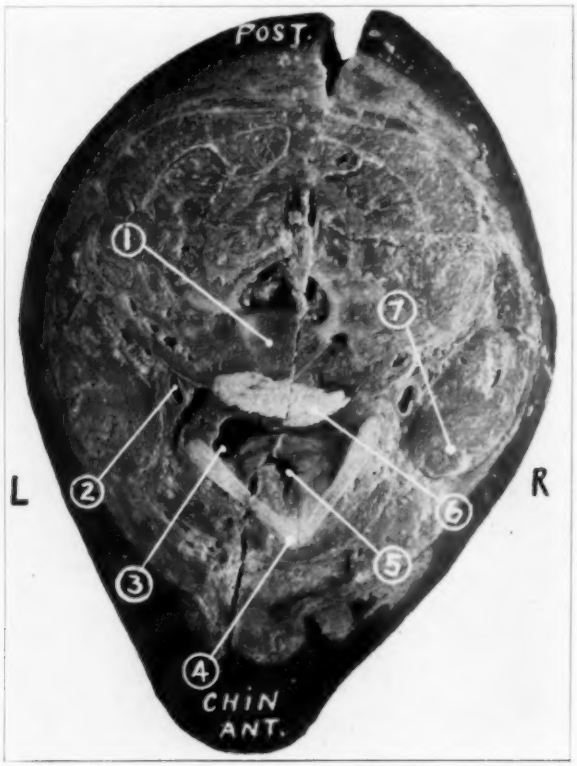

Fig. 4.—Frozen cross-section of the neck of an adult at the level of the thyroid cartilage, viewed from below. *1* indicates a vertebral body; *2*, the carotid artery; *3*, the esophagus; *4*, the thyroid cartilage; *5*, the vocal cord; *6*, the gauze pack in the postvisceral space, and *7*, the sternocleidomastoid muscle.

RETROPHARYNGEAL INFECTION

Retropharyngeal abscess, resulting as a rule from the breaking down of an infected lymph gland, should usually be opened through the mouth.

5. Iglauer, S., and Ransohoff, J. L.: Perforation of the Esophagus by a Foreign Body, with Report of a Case Presenting Unusual X-ray Signs, Laryngoscope **34**:821, 1924.

The patient should be placed in the hanging head position to prevent the aspiration of pus when the abscess is evacuated. With the index finger as a guide the bulging posterior pharyngeal wall should be perforated with a forceps, which should be opened within the cavity of the abscess. If a suction-pump is available, it should be used to evacuate the pus from the pharynx.[6] Tucker [7] recommended opening the abscess through a pharyngoscope and aspirating the pus with a suction-pipe introduced through the pharyngoscope. In cases of dyspnea he inserted a bronchoscope before using the pharyngoscope.

An external approach is indicated when the infection is secondary to spinal caries, in order to prevent contamination of the abscess with the buccal flora. Very large abscesses and retropharyngeal cellulitis should also be approached from the outside.

Posterior Approach.—By making the incision behind the sternocleidomastoid muscle practically all the branches from the carotid artery and the internal jugular vein can be avoided, and this usually renders the posterior approach much simpler than the anterior. Through a cutaneous incision the investing fascia is divided behind the muscle at a point on a level with the abscess. The patient's head should be rotated to the opposite side in order to draw the neurovascular bundle away from the spinal column. With blunt-pointed scissors the retropharynx can be reached and drained after perforation of a second layer of fascia situated behind the carotid sheath. In this approach the cervical ganglions, which are attached to the prevertebral fascia, should be avoided.

Anterior Approach.—This operation was originally described by Marschik,[8] of Vienna, under the name "superior cervical mediastinotomy" or "collar mediastinotomy." It was designed to drain infected areolar spaces about the lower part of the pharynx and the upper portion of the esophagus and to block the descent of infection through the upper thoracic aperture into the mediastinum. The operation was described by Schlemmer,[9] Glogau,[10] Palmer,[11] Beck [12] and others, and

6. Iglauer, S.: Retropharyngeal Abscess, in Piersol, G., et al.: Cyclopedia of Medicine, Philadelphia, F. A. Davis Company, 1934, vol. 9, p. 828.

7. Tucker, G.: Retropharyngeal Abscess from Lodgment of Foreign Body in Esophagus, J. A. M. A. **84**:511 (Feb. 11) 1925.

8. Marschik, H.: Mediastinotomie cervical superior, Wien. klin. Wchnschr. **29**:805, 1916.

9. Schlemmer, F.: Indikationstellung und Technic der Kollaren Mediastinotomie bei Halsphlegmone, Arch. f. Laryng. u. Rhin. **33**:412, 1920.

10. Glogau, O.: Children's Upper Respiratory Abscesses Descending into Neck and Mediastinum, Arch. Pediat. **40**:801 (Dec.) 1923.

11. Palmer, F. E.: Descending Abscess in the Neck, J. A. M. A. **83**:2067 (Dec. 27) 1924.

12. Beck, A. L.: Parapharyngeal Infections and Internal Jugular Vein Thrombosis: Diagnosis and Treatment, Laryngoscope **44**:431 (June) 1934.

was recently modified and elaborated by Heatly and Pearse.[13] The incision as originally employed by Marschik extended along the entire anterior border of the sternocleidomastoid muscle, but Pearse found that the lower half of the incision usually gives a sufficient exposure.

The anterior border of the sternocleidomastoid muscle, together with the neurovascular bundle, is retracted laterally. The thyroid gland is exposed and retracted medially. The middle thyroid vein is ligated and divided, and the inferior thyroid artery is usually severed between ligatures. The omohyoid muscle is severed if necessary. By blunt dissection behind the thyroid gland the esophagus is exposed and lifted away from the prevertebral fascia. A gauze pack is inserted behind the esophagus and brought out through the lower angle of the wound. Heatly and Pearse stated: "If the symptoms point to unilateral involvement, the operation is terminated. If bilateral extravasation is suspected, a similar incision is made on the opposite side and a drain inserted down to meet that already placed. Thus the visceral space is encircled and all paths of spread to the mediastinum effectively blocked."

Through a similar incision, preferably on the right side, Furstenberg[14] exposed the sternohyoid and the sternothyroid muscle and retracted these structures laterally, together with the sternocleidomastoid muscle and the underlying vascular bundle. The trachea and esophagus were then exposed, and by blunt dissection the posterior part of the mediastinum was entered and a drain inserted. Suction was applied at frequent intervals. In this approach the recurrent laryngeal nerve on the right and the thoracic duct on the left must be avoided.

In cases in which the infection has descended beyond the point at which the measures described are effective, dorsal mediastinotomy may offer the only hope of saving the patient. This formidable operation belongs in the domain of thoracic surgery. As a suggestion of a possible alternative to this procedure it may be stated that in several cases Seiffert[15] succeeded in draining a periesophageal infection into the esophagus by internal esophagotomy performed through an esophagoscope.

APPROACH TO THE PHARYNGOMAXILLARY FOSSA

Occasionally a case occurs as a sequel of tonsillectomy, under which circumstance the abscess may sometimes be reached by perforation of the constrictor muscle and its investing fascia through the bed of the tonsil.

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13. Heatly, C. A., and Pearse, H. E., Jr.: Management of Perforations of the Cervical Esophagus, Tr. Am. Bronchosc. Soc. 1932, p. 102.

14. Furstenberg, A. C.: Acute Mediastinal Suppuration, Tr. Am. Laryng., Rhin. & Otol. Soc. **35**:210, 1929.

15. Seiffert: Zur Erkennung und Behandlung von Oesophagusperforationen, Ztschr. f. Hals-, Nasen- u. Ohrenh. **12**:290, 1925.

Batson [3] demonstrated a simple external approach. A small vertical incision is made just above and behind the angle of the jaw; the fascia is divided, and the parotid gland is retracted backward. Scissors, curved on the flat surface, are introduced in a median forward direction, hugging the internal pterygoid muscle, opposite to which the abscess is to be entered.

In the cases in which the symptoms suggest thrombophlebitis a wide external approach, combined with an exposure of the internal jugular vein, is indicated. A curvilinear incision is made corresponding to the outline of the digastric fossa. The fascia is divided, and the submaxillary gland is exposed and partially elevated from its bed. The tip of the great horn of the hyoid bone is palpated; this, as described by Mosher,[16] constitutes an important landmark. The stylohyoid muscle and the posterior belly of the digastric muscle are exposed and retracted, and the parapharyngeal space [16a] is entered by blunt dissection. The posterior facial vein and its tributaries are traced toward the tonsillar bed, and the jugular vein is laid bare to determine the downward extension of the thrombus. Diseased portions of the vein and its tributaries should be exsected. The tonsil on the involved side should then be removed.

In a recent article Kramm [17] described what he considered a more accurate approach, affording better visualization of the cavity of the abscess and the tonsillar veins. The operation consists of an incision in the retromandibular fossa along the anterior border of the sternocleidomastoid muscle. The fascia is divided, exposing the lower posterior border of the parotid gland, which is avoided. The sternocleidomastoid muscle is retracted backward, exposing the posterior belly of the digastric muscle and the styloid process. The internal jugular vein

16. Mosher, H. P.: The Submaxillary Fossa Approach to Deep Pus in the Neck, Tr. Am. Acad. Ophth. **34**:19, 1929.

16a. Some confusion seems to arise from the terms "peripharyngeal" and "parapharyngeal," which are not interchangeable. The following quotation from one of my previous papers will aid in clarifying the subject:

The parapharyngeal space, or the pharyngomaxillary fossa, is of great surgical importance. On cross section of the neck at the tonsil level, the fossa is triangular in outline. It is bounded mesially by the lateral pharynx wall, laterally by the horizontal ramus of the jaw, the internal pterygoid muscle, and the parotid gland, posteriorly by the prevertebral fascia. The styloid process and styloid muscles divide the space into an anterior and a posterior compartment (prestyloid and retrostyloid). The posterior compartment contains the neuro-vascular bundle. The parapharyngeal space extends upward to the base of the skull and, according to Batson,[3] is limited below by the capsular fascias of the neck and the mylohyoid muscle.

Owing to its close proximity to the tonsil bed, infection of the parapharynx sometimes occurs as a complication of a peritonsillar or a retrotonsillar abscess.

17. Kramm, H.: Exposure of the Parapharyngeal Space Through Retromandibular Fossa, Ztschr. f. Hals-, Nasen- u. Ohrenh. **8**:212 (Feb.) 1924.

lies parallel to the styloid process and behind it. The tendon of the styloglossus muscle is detached from the styloid process in front, and a long nasal speculum is inserted into the prestyloid compartment of the parapharynx. To reach the retrostyloid compartment the jugular vein is drawn forward and the posterior belly of the digastric muscle, backward. A speculum is then inserted into the posterior compartment.

APPROACH TO THE NEUROVASCULAR BUNDLE

Infection occurs either in the lymph glands adherent to the neurovascular bundle or in the form of a septic thrombus within the jugular vein or some of its tributaries. As already stated, the neurovascular bundle is not a tube or conduit, since it is not surrounded by any continuous lamellar fascia (figs. 2 and 4). Parsons [18] regarded the "carotid sheath" as an artefact made with the scalpel by the anatomist or surgeon. The approach to the neurovascular bundle is usually made in the classic manner under the anterior border of the sternocleidomastoid muscle, and the bundle is exposed after retraction of the muscle. At times it may be advisable to split the muscle along the course of its fibers, and rarely it may be partially divided transversely. If the vein is seen to be occluded (or collapsed) it should be uncovered, together with its tributaries, until a normal area is reached. After ligation the diseased vein or veins should be resected.

LUDWIG'S ANGINA

No discussion of infections of the neck is complete without mention of Ludwig's angina. This clinical entity, an infection of the floor of the mouth, has been recognized for almost a century, since Ludwig described the disease in 1836. So many excellent treatises have been written on the subject that there is but little to add. The rules for treatment are the same as those for most cervical infections—free incisions and drainage.

SUMMARY

A brief review of some of the more recent studies of the cervical fasciae is presented.

The surgical approaches to the various areolar spaces of the neck are described. The spaces under consideration include the retropharyngeal, the retro-esophageal, the posterior mediastinal, the parapharyngeal, the neurovascular and the submental.

Prof. E. F. Malone and Dr. L. O. Morgan of the department of anatomy placed the material and facilities for this study at my disposal, and Dr. P. Goland assisted in some of the dissections.

707 Race Street.

18. Parsons, S. G.: Carotid Sheath and Other Fascial Planes, J. Anat. & Physiol. **44**:153, 1900.

Clinical Notes

RESECTION OF THE SUBMAXILLARY GLAND

With Report of a Case of Extravasation of Saliva Into the Sublingual Space

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Acute inflammation of the submaxillary gland may progress to an uneventful recovery, Ludwig's angina may develop or it may result in a low grade, chronic infective process confined largely to the gland itself. Such infections, except mumps, are usually secondary to oral or dental infections. Salivary calculi are a predisposing factor in many cases. Bailey [1] reported two cases of acute inflammation of the gland, both due probably to the presence of calculi, in each of which there promptly developed a typical form of Ludwig's angina. Many authors have emphasized the importance of free and early drainage of the submaxillary space in cases of Ludwig's angina. Some have expressed the belief that relief can best be obtained by early and complete excision of the submaxillary gland. Thus Ramsdell,[2] in a paper covering the anatomy and technic of removal of the gland, reported six cases of Ludwig's angina with early and complete excision of the gland, in all of which there was complete recovery.

The most common indications for removal of the gland, however, are the more chronic types of infection. Chronic conditions include tuberculosis, syphilis, actinomycosis, neoplasms and Mikulicz' disease. The conditions may be the result of simple extensions of acute infections of the mouth or throat.

Thus, Mrs. L., a woman aged 26, was first examined late in September 1934. She gave a history of acute tonsillitis associated in three or four days with swelling over the side of the face, beginning seven weeks prior to examination. This area had continued to be swollen, somewhat tender and indurated, until the examination. We were unable to probe the submaxillary duct. No saliva or pus could be expressed. Roentgen examination failed to reveal calculi. The gland was removed. There was some induration around the gland, with partial breaking down in the gland itself. The patient made an uneventful recovery after removal of the gland.

Most of the reports in the literature, however, are of cases in which the presence of calculi was probably the primary cause of the infection. Thus Garland and Lurie [3] reported several cases of chronic inflammation of the gland, all due to calculi in which the condition was relieved by removal of the gland. They included a good description of the anatomy and technic of removal. New and Harper,[4] in reporting one hundred and ten cases of nonspecific inflammation, noted salivary calculi in seventy. In twenty-seven of these the entire gland was removed;

Read at the staff meeting of the Nassau Hospital, Nov. 21, 1934.

1. Bailey, H.: Stones in the Submaxillary Gland, Practitioner **126**:671 (June) 1931.

2. Ramsdell, Edwin G.: Ludwig's Angina: Advantages of Submaxillary Resection, S. Clin. North America **14**:315 (April) 1934.

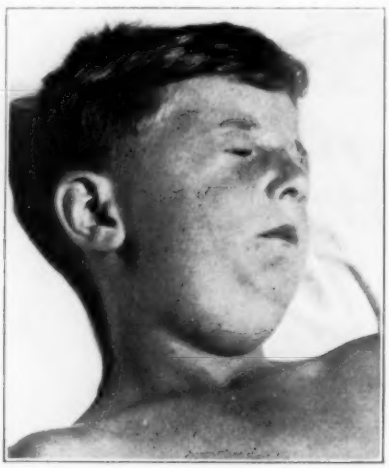
3. Garland, Frederick E., and Lurie, Moses H.: Treatment of Chronic Infection of Submaxillary Gland, New England J. Med. **200**:545 (March 14) 1929.

4. New, G. B., and Harper, F. R.: Chronic Inflammation of the Salivary Glands with or without Calculi, Surg., Gynec. & Obst. **53**:456 (Oct.) 1931.

in the other forty-three cases, the stone only. Of the forty cases in which there was no calculus the gland was removed in thirty-eight.

A typical history is a follows: Mr. M., a man aged 20, was first examined late in December 1933. He gave a history of a sore throat five weeks before, with swelling of the left submaxillary gland, which had continued. It was more marked on eating. The gland was tender, somewhat swollen and indurated. A calculus could be palpated in the posterior part of the duct. The duct was incised over the calculus, and the stone, about the size of a kernel of rice, was removed. The gland continued to be swollen and painful, however, so the entire gland was removed three weeks after the removal of the calculus. The patient made an uneventful recovery.

Rarely, of course, an atypical case presents itself for resection of the gland. In addition, I believe the following case presents a new and previously unreported complication of tonsillectomy.



Patient with extravasation of saliva

REPORT OF CASE

Stanley S., a boy aged 7 years, was first examined by us early in July 1934. He gave a history of a tonsillectomy in March of the same year. The operation, performed by another surgeon, was later reported to me as having been uneventful. Two weeks following the operation the boy first complained of a swelling underneath his tongue on the right side, and it was noted that the right side of his face was swollen. This was observed for a week, during which time the swelling became worse; it was then incised in the floor of the mouth. A saliva-like discharge was obtained. The condition improved for a few weeks, then became worse and an incision was made in the floor of the mouth by another surgeon, with the same result. At our first examination the boy presented a large swelling of the sublingual space on the right side, which pushed the tongue upward and to the left. The face and neck were also swollen on that side. Palpation and roentgen examination failed to reveal calculi. There was no evidence of infection, i. e., no redness, fever or induration. Normal saliva could be expressed from the duct, which could be probed, without evident obstruction. The swelling was again incised in the floor of the mouth, and saliva-like material was expressed. The probe passed through the incision and entered a large cystlike cavity in the sub-

lingual space. A diagnosis of retention cyst was made. After the incision the swelling disappeared. It began gradually to increase again; as this occurred, we felt that massage over the area produced more than a normal flow of saliva from the duct. As a result of this observation, we waited several weeks until the swelling was again marked, then made a small incision and after expressing part of the contents inserted a cannula and injected iodized poppy-seed oil 40 per cent. At first this produced an increased flow of saliva from the duct, after which we obtained a return flow of poppy-seed oil through the duct, thus demonstrating the involvement of the submaxillary gland and duct with the sublingual swelling. Roentgenograms confirmed this observation. The diagnosis, therefore, was a rupture of the salivary gland, with extravasation of saliva into the sublingual space. Early in September we removed the submaxillary gland. There was no induration around the gland. It was connected with a large cavity, involving the whole sublingual space, which contained saliva-like material. Because of the extent of the cavity and our belief that it did not contain a cystlike wall, no effort was made to remove the walls of the cavity.

The pathologic report was: "The tissue is that of the submaxillary gland in which a cavity has formed made up of a lining of granulation tissue."

The patient made an uneventful recovery.

We now believe that some trauma, probably with the mouth gag at the time of the tonsillectomy, produced an acute obstruction of the submaxillary duct, with resulting rupture of the gland and extravasation of saliva into the sublingual space. When the duct again began to function, part of the saliva continued to dissect the muscle planes into this space.

SUMMARY

We present this as a new complication of tonsillectomy and a new indication for resection of the submaxillary gland. While we have not made a complete search of the literature, we know of no report of a similar case.

TWO NEW FEATURES FOR THE NASOPHARYNGOSCOPE AND ALLIED INSTRUMENTS

Revision of the Lighting System and a New Type of Direction Finder

LOUIS K. PITMAN, M.D., NEW YORK

The nasopharyngoscope is an adaptation of the cystoscope. It differs from the parent instrument in size, and its lamp and lenses are in a fixed unit. In the majority of cystoscopes the lamp is fixed to the sheath and the sheath in turn slides over the lens portion of the instrument. My improvements are adaptable to all forms of illuminating observation telescopes used by members of the medical profession.

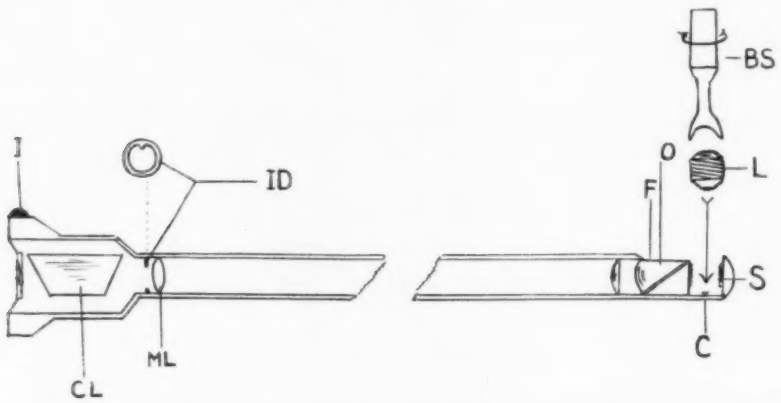
The nasopharyngoscope is a tubular telescope of small caliber (about 10.5 F). It is made up of two essential parts: (1) a series of lenses and a prism for the observation of the field of vision and (2) a lighting system to illuminate the field of vision.

The field of vision is the image seen through the eyepiece of the nasopharyngoscope. This is brought about by the series of lenses and the prism.

The field of illumination is the portion of the field of vision which is artificially illuminated by an illuminated electric bulb placed at the farthest end of the nasopharyngoscope.

The diagram shows a longitudinal cross-section of a nasopharyngoscope, with the intermediate lenses omitted. An object within the field of vision is seen through the eyepiece after the rays have passed through the fenestra *F* into the objective lens *O*, and have struck the mirrored diagonal surface of the lens, which deviates the reflecting rays through intermediate lenses within the lumen of the nasopharyngoscope. The rays are then magnified by the magnifying lens *ML*. The image is corrected by the correcting prism *CL* and is seen through the eyepiece as a corrected upright image.

My changes are as follows: 1. The objective lens *O* is brought closer to the end of the instrument by screwing the lamp within the side of the instrument adjacent to the lens and not within the long axis, as before. In the diagram, *L* is the lamp and *S* is the receiving socket. The threads are spiral with the long axis



A longitudinal cross-section of the nasopharyngoscope, showing: *F*, fenestra; *O*, objective lens; *L*, lamp; *S*, socket; *C*, contact at the base of the socket; *BS*, bridged screw-driver; *ML*, magnifying lens; *ID*, indicating diaphragm with nipple; *CL*, correcting prism, and *I*, indicator at the side of the eyepiece.

of the instrument. *C* is a contact at the base of the socket. *BS* is a bridged screw-driver which fits in peripheral notches of the exposed surface of the lamp to facilitate screwing the lamp. The arrangement of the lamp in this position omits dead space found at the distal end of all ordinary nasopharyngoscopes. The lamp is brought close to the objective and the objective is nearer the tip.

2. In all cystoscopes and nasopharyngoscopes there is a marker, usually in the form of a ball (*I*), situated at the side of the eyepiece. This marker denotes the position of the fenestra (*F*). It indicates to the observer the position of the image (up, down or to the right or left). I have not found this type of marker satisfactory, for when the threads of the eyepiece wear off the ball is automatically displaced with relation to the fenestra. Also, it is necessary to hunt the position of the marker by sense of touch, thus delaying the operation.

I have overcome these difficulties by incorporating the marker within the field of vision. A diaphragm *D* (carrying a nipple or other type of marker) is placed

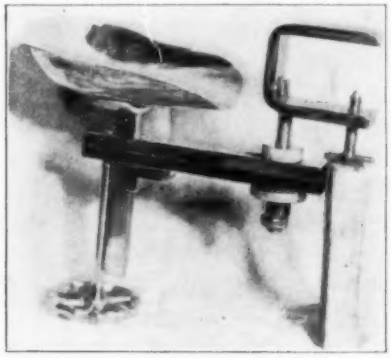
between the magnifying lens *ML* and the correcting lens *CL*. The diaphragm is so placed that the nipple when seen in the field of vision corresponds to the position of the fenestra. The indicator is always fixed and within the field of vision. The position of the marker may not be limited between the two lenses, for a marker can be placed anywhere within the path of the rays of the field of vision, i. e., between the lenses and in other spaces within the lumen of the nasopharyngoscope.

115 West Eighty-Sixth Street.

A NEW SURGICAL HEAD-REST

HARVEY S. RUSK, M.D., PUEBLO, COLO.

The need for a satisfactory mechanical head-rest has been felt by all bronchoscopists. Radical operations on the sinuses, surgical intervention for cleft palate, dental extraction under general anesthesia and treatment of retropharyngeal



A new surgical head-rest.

abscesses are best performed with the head extended and lowered. Recently tonsillectomy in the head-low position has been favored because of increased safety and ease of operation.

The head-rest shown here, which is more efficient than an assistant in supporting the head at a required level, is manipulated by means of a vertical worm screw and a handle below. The plate which supports the head is always parallel to the ordinary operating table, to which it is attached, and may be retracted toward or extended from it. Lateral movement is easy and smooth. The extremity of the plate is curved up, thus providing a support for the brow in maintaining the head in full extension. The plate is covered with thick rubber for comfort and to prevent the head from slipping. Robust patients, even when local anesthesia is used, rarely complain of the extension, since the occiput is securely and comfortably supported.

The head-rest was made for me by the Gobatti Manufacturing Company, Pueblo, Colo.

240 Colorado Building.

Progress in Otolaryngology

Summaries of the Bibliographic Material Available in the Field of Otolaryngology

TUMORS OF THE NOSE AND THROAT

GORDON B. NEW, M.D.
ROCHESTER, MINN.
AND
WALTER KIRCH, M.D.
DES MOINES, IOWA

NOSE AND SINUSES

Schibler [1] collected from the literature reports of 89 cases of melanosarcoma of the upper air and food passages. In 38 of these cases the lesion involved the nose and the paranasal sinuses; in 3, the pharnyx; in 4, the esophagus, and in the remainder, the gingivae and the palate. The larynx, trachea or bronchi were not involved unless there was extension or metastasis from a growth which was situated elsewhere. The most common points of origin in the nose were found to be the septum and the nasal meatus. The results of treatment in these cases confirmed the well known fact that melanosarcoma of these structures is highly virulent.

Houser [2] reported 21 cases in which there was a primary malignant neoplasm of the maxillary sinus. These patients were treated at the University of Pennsylvania Hospital. In 15 cases the tumor was treated surgically, either with or without electrocoagulation. The electrocoagulation was preceded and followed by irradiation. In 6 cases the growth was inoperable and was treated by irradiation. Two patients, or 13.3 per cent, survived for five years. The author expressed the opinion that irradiation offers the best hope of cure but said that surgical procedures are necessary for adequate exposure and drainage.

Fenton [3] reported a number of cases in which extensive and incurable malignant neoplasms of the paranasal sinuses were treated by a com-

From the Section on Laryngology, Oral and Plastic Surgery, the Mayo Clinic.

1. Schibler, W.: Ueber die Häufigkeit und den Verlauf der Melanosarkome der oberen Luft- und Speisewege, Ztschr. f. Hals-, Nasen- u. Ohrenh. **35**:241, 1934.

2. Houser, K. M.: Diagnosis and Treatment of Primary Malignant Neoplasms of the Maxillary Sinus, Tr. Sect. Laryng., Otol. & Rhin., A. M. A., 1933, p. 76; Arch. Otolaryng. **18**:643 (Nov.) 1933.

3. Fenton, R. A.: Some Annoyances in the Management of Malignancies of the Accessory Sinuses, Ann. Otol., Rhin. & Laryng. **43**:39 (March) 1934.

bination of irradiation and electrosurgery. The main interest lies in the description of the numerous complications which are characteristic of these lesions.

Davis [4] reported briefly the results obtained in 50 cases of carcinoma of the maxilla and ethmoid during the past twelve years. He divided these cases into two groups: (1) a group of 9 cases in which a squamous epithelioma arose in the alveolus or hard palate or in the region of the molar teeth, and (2) a group of 41 cases in which the growth arose in the upper part of the nose. The symptomatology was briefly described. The treatment consisted in most cases of a combination of surgical intervention, electrocoagulation and irradiation. The technic was described. There were no operative deaths. The ocular and meningeal complications were not as common as they were in the cases which were reported by Ohngren.[5] The results were uniformly poor. Only 6 of the patients in the second group survived without recurrence for more than two years. All the patients in the first group had recurrences before two years had passed.

Cooper [6] reported 2 cases of solitary plasmocytoma. In 1 of these cases, in which the growth involved the nasal bone, it was treated with radium therapy but it recurred. In the other case the growth, which involved the left antrum, was removed by lateral rhinotomy, which was followed by irradiation. This type of growth, which is identical with multiple myeloma, was discussed, and the 32 cases of its occurrence in the upper respiratory passages which have been described in the literature were reviewed briefly. The author also reported a case of rhabdomyoma of the left paranasal sinuses, which he believed to be the only one ever reported. He expressed the belief that this tumor had its origin in the internal pterygoid muscle. Lateral rhinotomy and irradiation were employed.

A case of basal cell epithelioma of the nasal septum which recurred repeatedly following surgical removal in the course of four years and which did not show any tendency to metastasize or infiltrate was reported by Bredlau.[7] He took occasion to discuss the pathologic features of epithelial neoplasms that arise in the mucous membrane of the upper respiratory passages and reviewed the literature on the subject. He concluded that the various terms, such as cylindroma

4. Davis, E. D. D.: Carcinoma of the Maxilla and Ethmoid: A Survey of Notes of Fifty Cases, Brit. M. J. **1**:53 (Jan. 13) 1934.

5. Ohngren, quoted by Davis.[4]

6. Cooper, K. G.: Plasmocytoma and Rhabdomyoma of the Paranasal Sinuses; Pathologic and Surgical Considerations: Report of Cases, Arch. Otolaryng. **20**: 329 (Sept.) 1934.

7. Bredlau, E. A.: Recurrent Basal Cell Carcinoma of the Nasal Septum: Histogenesis of So-Called Cylindromas, Arch. Otolaryng. **20**:382 (Sept.) 1934.

and endothelioma, are erroneous and expressed the opinion that these tumors, which have their origin in the basal layers of the covering epithelium, should be classed among the basal cell epitheliomas.

NASOPHARYNX

Cappell [8] reported 12 cases of lympho-epithelioma of the nasopharynx and tonsils which had been studied with great care. From this study he came to the conclusion that lympho-epithelioma forms a definitely individual type of epithelial neoplasm. He distinguished two types: The first, which is more common in the nasopharynx, was described by Regaud [9] and is more markedly epithelial in appearance; the second, which is found more frequently in the tonsils, resembles that which was described by Schmincke [10] and is similar to lymphosarcoma, for which it probably was mistaken by earlier authors. The characteristic feature of the two types is the presence of strands of epithelial elements in a stroma that is rich in lymphocytes. There may be a definite epithelial syncytium. In the second group the appearance of epithelial strands is frequently lost and cells are often ill defined and have large vesicular nuclei. The author expressed the opinion that the fact that the metastasis also presents the same admixture of lymphocytic elements is proof that this tumor is a definite entity and that it presents some type of affinity for lymphoid tissue. He stressed the exceptional radiosensibility of these tumors. He expressed the belief, as did Ewing, that transition cell epithelioma is closely related to lympho-epithelioma. The article is well worth reading and contains clear photomicrographs.

Jönsson [11] reported the results of roentgenologic examination of 33 patients with malignant tumor of the nasopharynx who were seen during the past three years at the Serafimer Hospital. In 26 cases the tumor was demonstrable clinically, and there was roentgenologic evidence of the growth in 18. In 4 cases a nasopharyngeal neoplasm was diagnosed roentgenologically before there was any objective evidence of its presence. In the 15 cases in which there was involvement of the optic, oculomotor, trochlear or abducens nerve or the first branch of the trigeminal nerve, there also was roentgenologic evidence of the involvement of bone. There was no evidence of invasion of bone in cases in which there was an absence of neurologic symptoms. The best roentgenologic exposure for the tumors which arise from the sides of the nasopharynx was found to be the axial, and for those which arise from

8. Cappell, D. F.: On Lympho-Epithelioma of the Nasopharynx and Tonsils, J. Path. & Bact. **39**:49 (July) 1934.

9. Regaud, quoted by Cappell.[8]

10. Schmincke, quoted by Cappell.[8]

11. Jönsson, Gunnar: Röntgenologic Findings in Malignant Tumors of the Nasopharynx, Acta radiol. **15**:1, 1934.

the vault, the lateral. The smallest tumors which could be identified with roentgenograms were the size of a hazelnut. The roentgenologic technic was described, and numerous roentgenograms were presented. Roentgenograms are of value as an aid to diagnosis, especially for determining the extent of the lesion and for distinguishing nasopharyngeal neoplasms from those arising intracranially.

Ruedi and Zuppinger [12] recommended the filling of the postnasal space with iodized poppy-seed oil 40 per cent for the roentgenologic diagnosis of tumors of the nasopharynx. They found that this method gave valuable information as to the seat and extent of these growths and that the difference in contour afforded some indication as to whether or not the tumor was malignant.

Christianson and McArthur [13] reported 3 cases of nasopharyngeal carcinoma and the results of their histologic studies of the tissue removed for biopsy or obtained at necropsy. They found that all the neoplasms were formed of tissue resembling immature squamous or pseudostratified epithelium, such as that which lines the nasopharynx. The authors discussed the pathologic process and reviewed the literature. They appeared to consider superfluous the classification of a group of these neoplasms as lympho-epitheliomas.

Pollock [14] reported 2 cases of plasmocytoma of the nose and nasopharynx. Both cases were described at length and good photomicrographs were included. In 1 case the tumor arose from the floor and septum of the nose and apparently was primary; in the other case the tumor was attached laterally to the orifice of the eustachian tube and apparently was metastatic, as multiple myelomas were found at necropsy. These tumors, which were found to be rare, consisted of plasma cell-like elements. They evidently were related to multiple myelomas but in the first case no roentgenologic evidence of other lesions was found. The possibility that this tumor was related to lymphosarcoma was discussed.

Allan [15] reported 3 cases of fibroma of the nasopharynx and reviewed the literature on the subject. These growths most often affect boys; they occur during adolescence and may regress spontaneously. The author suggested a theory as to their genesis. The most frequent point of origin appears to be the base of the sphenoid bone and the anterior

12. Ruedi, L., and Zuppinger, A.: Zur Röntgenokontrastuntersuchung des Nasopharynx, Ztschr. f. Hals-, Nasen- u. Ohrenh. **35**:500, 1934.

13. Christianson, Oscar, and McArthur, S. W.: Nasopharyngeal Carcinoma, Arch. Surg. **27**:1109 (Dec.) 1933.

14. Pollock, F. J.: Plasmacytoma of the Nose and Nasopharynx, Arch. Otolaryng. **19**:311 (March) 1934.

15. Allan, W. B.: Nasopharyngeal Fibroma, Arch. Otolaryng. **19**:216 (Feb.) 1934.

part of the occipital bone. The author expressed the opinion that the fibroma may arise from the perichondrium covering a plate of cartilage which connects the occipital bone to the sphenoid bone until early adult life. The change may be brought about by the alteration of the blood supply which results from the calcification of this cartilaginous plate. The treatment was discussed. The earlier mutilating operations have been discarded on account of the high mortality and the frequent recurrence of the tumor. The cold snare and the cautery loop have been efficacious, and electrolysis has been even more so, but the best results have been obtained with radium therapy. The greatest danger is from hemorrhage.

Wells [16] described an extensive papilloma of the nose which filled the right nostril, right antrum and entire postnasal space. The growth was removed in fragments by means of the cold snare. It showed a strong tendency to bleed and to recur, which was controlled with roentgen therapy. The author reviewed the literature and found reports of only 100 cases in which the tumor was definitely proved to be a papilloma. A true papilloma is a fibro-epithelial neoplasm in which the preponderant epithelial tissue gives the tumor a characteristic papillary appearance. The cells are of a normal type and are uniform in size. There is a sharp demarcation between the two tissues. The author classified these tumors according to their point of origin. Papilloma of the nose is essentially benign but may undergo malignant change and show a strong tendency to bleeding and recurrence. This change was found in 3 or 4 cases. The treatment consists in radical removal if the growth is small and localized. If the growth is extensive and multiple and invades the sinuses, operation has been followed in most cases by disastrous results. In these cases irradiation has been found to be of considerable value.

LARYNX

Beavis [17] reported 5 cases of amyloid disease of the larynx and reviewed the literature on this subject. He followed the classification of New [18] and of Seckel [19] by which these tumors are divided into three groups: (1) diffuse subepithelial infiltration, (2) tumor-forming local amyloid deposits and (3) amyloid degeneration of preexisting tumors. All three types were represented in the cases reported. These tumors affected men who were past 35 years of age. The most common situa-

16. Wells, W. A.: Nasal Papilloma, with a Report of a Case with an Enormous Nasopharyngeal Extension, Laryngoscope **43**:918 (Nov.) 1933.

17. Beavis, J. O.: Local Amyloid Disease of the Upper Air Passages; Report of Five Cases, Arch. Otolaryng. **19**:439 (April) 1934.

18. New, G. B.: Amyloid Tumors of the Upper Air Passages, Laryngoscope **29**:327 (June) 1919.

19. Seckel, P., quoted by New.[18]

tion was the larynx. In 1 case there were multiple lesions which involved the larynx, pharynx, tonsils, tongue and mouth. The origin of these lesions is still unknown; only occasionally can evidence of chronic infection, such as accompanies amyloid degeneration of other organs, be found. If the tumors are small, peroral removal may suffice; if they are extensive, thyrotomy may be necessary, and if they are implanted on a malignant neoplasm of the larynx it is necessary to resort to laryngectomy. New recommended fulguration and radium therapy in the cases in which there is extensive infiltration. Beavis found that antisyphilitic therapy was of value in a case in which there were multiple lesions. This was tried because the patient had previously received benefit from similar treatment after a diagnosis of syphilis had been made clinically.

Imperatori [20] reported a case in which a woman had a large fibrolipoma which originated in the arytenoid cartilage and the aryepiglottic fold. He successfully removed the tumor by suspension laryngoscopy with the patient under ether anesthesia following preliminary tracheotomy. He briefly reviewed the literature. Two cases of branchiogenic growths in this area which were seen by Imperatori are of interest. All these patients were women. Imperatori [21] also reported a case of rhabdomyoma of the left vocal cord which affected a man 23 years of age. The tumor was removed through the Jackson laryngostat. The author was unable to find mention of a similar case in the literature.

Davis [22] reported a case of lipoma of the aryepiglottic fold in a woman aged 29.

Kleinfeld [23] reported a case of myoblastoma of the left vocal cord in a man aged 50. The tumor was removed by indirect laryngoscopy under local anesthesia. These tumors are composed of polygonal cells which resemble xanthoma cells and a ribbon-like syncytial mass which resembles early embryonal muscle fiber. They can be distinguished from xanthomas by the absence of fat. They usually are benign. The author found that 4 other cases had been reported in the literature. There was evidence of malignancy in only 1 of these cases. The author expressed the opinion that in the case of rhabdomyoma which was reported by Imperatori the lesion resembled a myoblastoma and that more cases will be recognized if this neoplasm is kept in mind. Clear photomicrographs and a bibliography accompany the report.

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20. Imperatori, C. J.: Fibrolipoma of the Larynx, Laryngoscope **43**:940 (Nov.) 1933.

21. Imperatori, C. J.: Rhabdomyoma of the Larynx: Report of a Case, Laryngoscope **43**:945 (Nov.) 1933.

22. Davis, E. D. D.: A Lipoma of the Larynx, J. Laryng. & Otol. **48**:824 (Dec.) 1933.

23. Kleinfeld, L.: Myoblastoma of the Larynx: Report of a Case, Arch. Otolaryng. **19**:551 (May) 1934.

An article which was read by MacKenty [24] at the Congress of the American College of Surgeons in 1930 was published posthumously. This article consists of case reports, numerous illustrations and comments; it is practically a review of the pathologic changes which occur in the larynx, including such rare conditions as acromegaly, scleroma, blastomycosis and pemphigus. It cannot be abstracted adequately but should be read in its entirety.

Figi [25] reported that 539 patients with malignant tumor of the larynx were seen at the Mayo Clinic between Jan. 1, 1925, and Jan. 1, 1934. In 20 cases the growth originated above the glottis, usually in the epiglottis; a few of the tumors originated in the aryepiglottic folds. All but 1 of the patients were men. Several of these tumors originated in the posterior and posterolateral aspect of the arytenoid cartilage. The growths usually were squamous cell carcinomas of low grade, but fibrosarcomas were found in 2 cases. One of the latter tumors originated in the laryngeal ventricle. A tendency to metastasis or infiltration was remarkably absent in the growths that involved the epiglottis. Diagnosis usually was easy but the author stressed the necessity for biopsy. Six selected cases were reported in order to describe the forms of treatment used in the various cases. Laryngeal suspension with the Lynch apparatus and a special short spatula, Hasslinger's directoscope, lateral pharyngotomy and indirect laryngoscopy were found to be adapted to individual cases. In 1 case the fibrosarcoma was successfully treated with radium. The author stressed the need of using the technic adapted to the individual case.

Hennessy [26] reported a case of chondroma of the larynx. The only treatment was tracheotomy to relieve the dyspnea. The tumor apparently originated in the posterior portion of the cricoid cartilage.

Asherson [27] described a method of fixing radium needles in position in the treatment of carcinoma of the larynx. One device consists in threading the needles through a specially woven loose net of seven day catgut, which is then fixed in the desired position. The needles can be removed without difficulty as soon as the catgut has been absorbed. The other method consists in threading a length of silkworm gut through the eyes of the needles. The two ends of the silkworm gut are

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24. MacKenty, J. E.: Malignant Disease of the Larynx; Rare Types, Premalignant Conditions and Conditions Simulating Malignancy, Arch. Otolaryng. **20**:297 (Sept.) 1934.

25. Figi, F. A.: Supraglottic Tumors: Methods of Treatment and Illustrative Cases, Arch. Otolaryng. **20**:361 (Sept.) 1934.

26. Hennessy, R.: A Chondroma of the Larynx, Australian & New Zealand J. Surg. **4**:75 (July) 1934.

27. Asherson, N.: Cancer of the Larynx: Anchorage of Radium in Its Treatment, Lancet **2**:640 (Sept. 16) 1933.

then passed through the soft tissues and brought out through the skin after the needles are in position. When this suture is drawn tight the needles are anchored firmly.

Babcock [28] reviewed the cases of benign and malignant tumors of the larynx in which the patients had been observed and treated at the Presbyterian Hospital in Philadelphia. In three years 27 carcinomas were treated. Of these the intrinsic and radioresistant growths were treated surgically, the others with roentgenotherapy. The tumors in the radioresistant group are characterized by the degree of differentiation, the adult character and the uniform size and staining of the cells, the presence of intercellular bridges, keratinization and pearls and the rarity of mitosis. The tumors in the radiosensitive group may be recognized by the lack of differentiation, the embryonal character of the cells, their varying size and staining power, the absence of intercellular bridges, keratinization and pearls and the abundant mitosis. Laryngectomy was performed in 6 cases; in 2 of these cases the patient died postoperatively.

Graham [29] reported 2 cases of chondroma of the larynx. The diagnosis was made from the clinical findings and the roentgenograms. Operation was not performed in either case.

Howarth and Chamings [30] briefly described thyrotomy for the removal of cystic mucous glands situated in the ventricle of Morgagni. The authors suggested that in many of the cases in which the condition is diagnosed as prolapse of the ventricle the lesions are actually the result of similar tumor formation, perhaps with associated prolapse.

Romonek [31] in a brief but comprehensive article reviewed all that is at present known about the etiology and treatment of papilloma of the larynx. He reported the case of a child with stenosis following surgical removal of multiple papillomas cured by Schmiegelow's method. Thyrotomy was performed by cutting through the scar tissue; a rubber tube was inserted between the freshened tissues and was fastened to the cartilage with silver wire. The author warned against the use of any but the best silver tracheotomy tubes as in 1 of his cases the tube was aspirated into the bronchi following corrosion. The most successful treatment in the hands of the author has been surgical removal followed by radium therapy.

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28. Babcock, J. W.: Tumors of the Larynx, S. Clin. North America **14**:301 (April) 1934.

29. Graham, H. B.: Chondroma of the Larynx: Case Report, Ann. Otol., Rhin. & Laryng. **43**:299 (March) 1934.

30. Howarth, W., and Chamings, A. J.: Cystic Adenomata of the Ventricles of Morgagni, J. Laryng. & Otol. **49**:324 (May) 1934.

31. Romonek, P. L.: Laryngeal Papillomatosis, Nebraska M. J. **19**:130 (April) 1934.

Clerf [32] reported his results with a radical type of laryngofissure in the treatment of carcinoma of the larynx. Fifty-eight patients were included in his series, 54 men and 4 women; all had been operated on more than three years previously. The author's technic, which is a modification of the Jackson technic, varies with the extent and situation of the lesion and the grading of the malignancy. For this purpose four graded groups of carcinomas are considered: a low grade group, a differentiated group, an anaplastic group (in which there is a high degree of malignancy) and an intermediate group. Because of the results which New and Fletcher [33] reported in the microscopic study of excised larynges, the author argued that a margin of 7.5 mm. beyond the demonstrable borders of the growth offers reasonable safety in the removal. In cases in which the tumor was found to involve the cartilage itself, the author performed laryngectomy. He reported an operative mortality of 8.6 per cent. The growth recurred in 8 cases; in 7 of these the patients died irrespective of laryngectomy or irradiation. One patient was still alive three years and three months after laryngectomy. In 5 of the cases there were local recurrences, and the author expressed the belief that the operation was not sufficiently radical. Three of the patients died of metastatic lesions. There were 8 patients with low grade carcinoma, 19 with the intermediate type and 8 with the anaplastic type. Four of the patients in the last-mentioned group were free from recurrence for more than five years. A total of 18 patients were well for more than five years, and 35, for more than three years.

Myerson [34] in reporting 3 cases of cysts of the larynx gave a comprehensive review of the literature and discussed the symptoms and treatment. Most of these cysts are either retention cysts, which are similar in origin to salivary or sebaceous cysts, or congenital cysts, which contain both endodermal and mesodermal structures. Lymph or blood cysts and traumatic cysts are also recognized but are rare. The symptoms vary according to the situation of the cyst. The most frequent and important symptom is obstruction. On objective examination by direct or indirect methods, a smooth, translucent cystic-looking mass is observed. The author expressed the opinion that many infants who are believed to have died of asphyxia neonatorum may have been victims of cysts of the larynx. The treatment consists in surgical removal if the patient is old enough to undergo operation. If the cyst

32. Clerf, L. H.: Carcinoma of the Larynx: Analysis of Fifty-Eight Cases with Treatment by Laryngofissure, Arch. Otolaryng. **19**:653 (June) 1934.

33. New, G. B., and Fletcher, Eleanor: The Selection of Treatment for Carcinoma of the Larynx, J. A. M. A. **99**:1754 (Nov. 19) 1932.

34. Myerson, M. C.: Cysts of the Larynx, Arch. Otolaryng. **18**:281 (Sept.) 1933.

affects a small child, it may be safer to burn a hole in the cyst with the cautery and evacuate the contents temporarily. Tracheotomy is frequently necessary. Removal with the snare by the methods of direct or indirect endoscopy, thyrotomy and pharyngotomy has been accomplished with success. One of the author's cases proved of unusual interest because of the presence of a second cyst in the upper part of the trachea.

In a highly technical article Douglas Webster [35] discussed Coutard's [36] protracted tractional method of roentgenotherapy, which he adopted after trials with various other methods. He came to the conclusion that this method gives by far the best results. He reported 42 cases and compared the different technics employed. He reviewed the statistics of various large clinics and found that in every case the Coutard technic was the most successful. Coutard obtained three year cures in 32 per cent of his cases. The results which have been obtained with other methods do not even approach this figure. He described the Coutard technic and explained it clearly. The article should be read by any one who comes in contact with many patients with laryngeal and epilaryngeal carcinoma. The main disadvantages of the method are the great expense, the length of time necessary to carry out the treatment and the necessity for prolonged hospitalization of the patient.

Since 1931 50 cases of tumors involving the larynx and hypopharynx have been observed at the Finsen Institute and Radium Center. Worning [37] found that laryngoscopy and roentgenologic examination complemented each other in the study of these cases. Radiologic examination, while of little value in the making of a differential diagnosis, is of great importance in making a decision as to treatment. The history of the development of roentgenologic diagnosis of these tumors was given briefly. The author described the normal course of ossification in the male and female and the variations caused by syphilis and tuberculosis. The technic was described, and the normal roentgenologic appearance of the larynx and hypopharynx was shown. Roentgenologic examination can be depended on to disclose the lower limits of the tumor, the amount of extension behind the larynx, the amount of destruction of cartilage, the results of treatment and the appearance of a recurrence. The roentgenograms which are reproduced are convincing. All the patients were treated with roentgenotherapy according to the method of Coutard, and the immediate results were excellent.

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35. Webster, J. H. D.: The Protracted-Fractional X-Ray Method (Coutard) in the Treatment of Cancer of the Larynx, Proc. Roy. Soc. Med. **27**:901 (May) 1934.

36. Coutard, H., quoted by Webster.[35]

37. Worning, Börge: Roentgen Examination of Laryngeal and Hypopharyngeal Tumors, Acta radiol. **15**:8, 1934.

Helwig and Jaime [38] reported a case of laryngeal scleroma. The patient was a Mexican who was born in Kansas City and who had never been outside the city. The authors found only 1 other report of a case of scleroma, in that case the patient being a native born American. They discussed the pathology of the disease as found in the literature and came to the conclusion that Frisch's bacillus was the causative organism.

ESOPHAGUS

Watson [39] reported 17 cases of carcinoma of the esophagus in which gastrostomy was performed by the Janeway technic. There was only 1 death, which was caused by pneumonia. The article is interesting because of this low mortality, and a detailed description is given of the postoperative care and feeding. The longest survival after operation was twelve months.

Grey Turner [40] reported the successful removal of the entire esophagus for the treatment of early carcinoma of the lower third. This was accomplished by what he called the "pull through" method. This method consists in performing gastrostomy and freeing the lower part of the esophagus from the mediastinal tissues with the finger. The same procedure is then executed from above through an incision in the neck. The esophagus is cut through from above as close to the growth as feasible and the upper stump fixed to the skin. The lower portion of the esophagus, which contains the tumor, is then pulled down through the diaphragm and amputated close to the stomach. An external esophagus is formed with a skin flap and connected above to the esophagostomy opening and below to the stomach by means of an intermediate loop of jejunum. In the case which was reported, normal ingestion was reestablished after some difficulty because of the formation of fistulas at the points of junction. It was interesting to note that the fistulas were partially the result of inadvertent reversal of the loop of jejunum with consequent regurgitation. Two other patients were treated in a similar manner. Of these 1 died from the tearing of both pleurae when the esophagus was pulled down, the other died from infection which developed around the gastrostomy tube. In another case the entire stomach as well as the spleen and esophagus was removed. This patient died eight weeks later from a mediastinal abscess. The author made the interesting observation that there was delay in healing

38. Helwig, F. C., and Jaime, N.: Laryngeal Scleroma in a Native Missourian: Report of Case, Arch. Otolaryng. **18**:310 (Sept.) 1933.

39. Watson, W. L.: Routine Management of the Gastrostomy Patient, New York State J. Med. **33**:1261 (Nov. 1) 1933.

40. Turner, Grey: Recent Advances in the Treatment of Carcinoma of the Oesophagus from the Surgical Aspect, J. Laryng. & Otol. **49**:297 (May) 1934.

in the case in which the result was a success. This was caused by a diet which produced symptoms of scurvy. When the diet was corrected, the patient recovered.

Cleminson and Monkhouse [41] reported 89 cases of carcinoma of the esophagus which were observed between 1925 and 1932 at the Middlesex Hospital in London. In 79 of these cases the patients were men and in 10 they were women. In 55 cases the tumors were found to be in the middle third of the esophagus, in 28 in the lower and in 6 in the upper third. The treatment consisted in the application of radon seeds by means of a Souttar tube. The results were exceedingly disappointing. The average period of survival was found to be only five and one-half months. The period of survival varied according to the situation of the growth and was slightly longer in women than in men. The period of dysphagia also was somewhat longer in women than in men.

41. Cleminson, F. J., and Monkhouse, J. P.: Carcinoma of the Oesophagus Treated by Radiation, J. Laryng. & Otol. **49**:313 (May) 1934.

Abstracts from Current Literature

Ear

HEARING IMPAIRMENT IN SCHOOL CHILDREN. BEATRICE ROSSELL, New York State J. Med. **33**:1387 (Dec. 1) 1933.

A survey of the hearing acuity of pupils of ten public schools in Buffalo was made, the 4A audiometer being used. These examinations are not as difficult as formerly and should be used in all schools to detect early deafness. In many cases the condition can be improved by treatment, and in cases of severe and advancing deafness lip-reading can be introduced without the usual delay.

AIKMAN, Rochester, N. Y. [AM. J. DIS. CHILD.]

LATENT MASTOIDITIS AS A CAUSE OF GASTRO-ENTERITIS IN AN INFANT. W. KELLER, Indian J. Pediat. **1**:115 (Jan.) 1934.

Keller reports a case of acute intestinal intoxication in a 10 week old infant, who was cured by antrotomy. He believes that if the symptoms of acute intestinal intoxication develop in an infant having otitis media and no other known etiologic factor it may be taken for granted that the inflammation has spread to the antrum and neighboring sinuses, and in such cases it is reasonably certain that antrotomy will bring about a cure.

GONCE, Madison, Wis. [AM. J. DIS. CHILD.]

INTRACRANIAL HYPERTENSION NOT CAUSED BY CEREBRAL TUMOR AND THE ACOUSTIC NERVE. N. METZIANU, N. JONESCO-SISESTI, TZETZU and D. BORS, Rev. d'oto-neuro-opht. **11**:721 (Dec.) 1933.

In the internal auditory meatus the auditory and facial nerves and the intermediary nerve of Wrisberg are enveloped in the same layer of arachnoid membrane. They next traverse the space between the cranium and the cerebral trunk, where they are bathed directly in the cerebrospinal fluid. In the brain stem, Deiters', Roller's and the triangular nuclei are almost subjacent to the ependyma of the fourth ventricle, and the stria acustica lies on its floor; the cochlear pathways terminate in a cortical center. At all of these places the nerve tracts are directly exposed to the influence of hypertension of the cerebrospinal fluid.

The causes, other than neoplasms, of intracranial hypertension are: (1) acute or chronic meningitis, (2) cerebral arachnoiditis, (3) cerebral parasitosis (Cysticercus), (4) trauma (hemorrhage), (5) congenital malformations (imperforate aqueduct of Sylvius), (6) disturbances of the venous circulation, both inside and outside the cranium (thrombosis of the intracranial veins, asystole) and (7) diverse causes, such as uremia, lead poisoning, arterial hypertension and intestinal parasitosis.

After the optic nerve, the auditory nerve is most sensitive to hypertension, and the vestibular portion is more vulnerable than the cochlear. There is no parallelism between the intensity of the cochleovestibular syndrome and the degree of hypertension. Factors other than pure hypertension determine the production of the acoustic phenomena: a particular fragility of the cochleovestibular apparatus, a congenital predisposition or a peculiar neurovegetative constitution.

Vestibular disturbances are more frequent in cases of hypertension caused by chronic meningitis than in those resulting from the acute form. Spontaneous nystagmus and vertigo are the prominent signs; they are accompanied by hypoexcitability to caloric stimulation with almost normal reactions to rotation and to galvanism. In hypertension from arachnoiditis, the rapidity of the development of the hypertensive syndrome depends on the location of the arachnoiditis. Cochleovestibular signs in this condition are hyperacusis or hypo-acusis and global or

partial vestibular hypo-excitability. Monier-Vinard, Ramadier and Chaussé have reported a case of cystic arachnoiditis of one pontocerebellar angle that was accompanied by bilateral cochleovestibular disturbances. According to Aubry, the effect of hypertension on the eighth nerve varies with the stage of evolution of the process. In the first stage there is pure stasis, characterized by slight functional labyrinthine disturbances. In the second stage lesions analogous to those observed in optic neuritis occur and are characterized by increase of vestibular disturbances, absence of vertigo reaction and hyporeflectivity in the caloric test; later they are characterized by much diminished reactions in the rotation test. Finally, there is diminution of reaction in the galvanic test.

Hypertension from parasitic cysts depends on the size of the cysts, their multiplicity or their location. Schmite considers that vestibular disturbances in cases of cerebral cysticercosis are due to hydrocephalus. They are characterized by abnormal attitudes of the head and by exaggeration of the headache, vertigo and vomiting with certain movements or changes of position of the head. These signs are found also in certain cases of tumors of the fourth ventricle. In all cases of intracranial hemorrhage, hypertension occurs. Its signs are usually masked by other grave symptoms. The sequelae of cranial traumatism include vestibular disturbances, which occur in repeated attacks, caused by transient hypertension. Lumbar puncture gives temporary relief. It is probable that in cases of arteriosclerosis, uremia and lead poisoning, vestibular symptoms, when present, are caused by slight persistent or transitory hypertension of the cerebrospinal fluid.

Three conditions explain the cochleovestibular disturbances created by intracranial hypertension: direct compression of the nerve trunk, compression of the endolymphatic sac and compression of the vestibular and cochlear central neurons. In many cases hypertension of the endolymph and of the cerebrospinal fluid coexist. Intracranial hypertension alone is not always responsible for cochleovestibular phenomena. Other factors are irritation from toxic foci, regional arachnoiditis, compression from cysts, local traumatic lesions and vascular fragility in such diseases as diabetes, uremia, arteriosclerosis and saturnism.

DENNIS, Colorado Springs, Colo. [ARCH. NEUROL. & PSYCHIAT.]

DEVELOPMENT OF A THEORY OF HEARING AND OF GALVANOTHERAPY ON THE BASIS OF THE STUDY OF AFTER-IMAGES AND OF ELECTRICAL NERVE PHENOMENA IN VARIOUS SENSORY AREAS. E. KUPFER, Monatschr. f. Ohrenh. **68**:767 (July); 943 (Aug.); 1041 (Sept.); 1208 (Oct.); 1294 (Nov.); 1462 (Dec.) 1934.

Kupfer says that the theory of the uniformity of nerve stimulation and of the uniformity of the type of reaction in all sensory areas, which has been advanced by a number of research scientists, was impressed on him likewise in the course of his study of after-images. So pronounced was this impression that the author decided to attack the problem from that angle and to show that the auditory sense is no exception but behaves like the other senses. In order to do this it was absolutely necessary to consider also the after-images and the electrical nerve phenomena of the other sensory areas. The author discusses the labyrinthine after-image, the optic after-image, the after-images of the gustatory, olfactory and temperature senses, the after-images of pain and of the tactile sense and finally acoustic after-images. In giving his attention to the acoustic after-images, he not only reviews the literature but describes his own experiences. He considers also galvanic sensory stimulation, pointing out that it was Urbantschitsch who first succeeded in producing movement phenomena in stationary pictures by electrical methods. If a galvanic current is made to act on the temples, the person so influenced can note a tendency to movement in stationary pictures. The author further discusses the galvanic stimulation of the perception of color, of pain and itching, of the labyrinth, of hearing, of the olfactory and the gustatory sense and of muscular and cutaneous sensations. Then he describes his studies of the electrochemical theory, analyzing in this respect vision, hearing and the sense of equilibrium

in the labyrinth. The last portion of his treatise is devoted to therapeutic studies. He discusses electrotherapy of the ear and gives advice as to the proper technic. He discusses also other galvanotherapeutic studies. EDITOR'S ABSTRACT.

REDUCTION OF BLEEDING IN OPERATIONS ON THE MASTOID. H. FREY, Monatschr. f. Ohrenh. **68**:1229 (Oct.) 1934.

Frey points out that the technical difficulty in operations on the mastoid is partly due to the fact that the operative field is constantly flooded with blood so that the surgeon or an assistant is obliged to use a tampon constantly. The reduction of bleeding is of great importance not only to the surgeon who may be obliged to operate without the aid of experienced assistants but also whenever important structures must be exposed and when intervention in the tympanic cavity is necessary. In order to reduce bleeding special measures must be taken before, during and after operation. Local anesthesia is advantageous in that it produces anemia in the operative field. For this reason the author employs local anesthesia even in operations that are performed under general anesthesia. The only operations on the mastoid in which he avoids the use of local anesthesia are those which are performed on patients who have a periosteal abscess, severe inflammatory infiltration of the soft parts or some other disorder that makes the use of local anesthesia inadvisable. He induces local anesthesia by injecting a solution of 0.5 per cent procaine hydrochloride and epinephrine (from 5 to 10 drops of epinephrine is added to 50 cc. of a 0.5 per cent solution of procaine hydrochloride). The anesthetic is introduced at the typical sites: in the region of the antrum, the tip of the mastoid, the posterior auditory wall and the lower auditory wall. Depending on the sensitivity of the patient, the local anesthetic can be administered before or after general anesthesia is induced. The author reduces bleeding during the operation by tamponing with styptic gauze (impregnated with methylaminoacetopyrocatechol) and by using a sterilized hypertonic solution of dextrose. During the postoperative toilet the anemic condition of the tissues, which is caused by the local anesthesia, is still in evidence and the cleansing of the operative field with a physiologic solution of sodium chloride can occasionally be omitted. In bandaging the wound the author uses for the first tamponade iodoformized wicks or strips of iodoformized gauze, which are saturated with sterile liquid petrolatum.

EDITOR'S ABSTRACT.

IMPAIRMENT OF THE AUDITORY APPARATUS DUE TO MEAT POISONING. P. ZÁVIŠKA, Monatschr. f. Ohrenh. **68**:1333 (Nov.) 1934.

Záviška reviews the cases of auditory disturbances due to meat poisoning that have been reported in the literature and then describes eight cases of his own. He points out that it is primarily the vestibular nerve that becomes involved. Among his eight patients there were five in whom the cochlear nerve also was impaired, but these were the severest cases, and the impairment was less than that of the vestibular nerve. Deafness, which occasionally develops as a result of pure cochlear neuritis, was not noted in any of these cases. The cochlear involvement not only was slighter but disappeared more rapidly than the vestibular disorder. Other nerves may become involved so that the disorder assumes the aspects of polyneuritis, as was observed by the author in three cases. Concerning the localization of the disorder he says that it is a retrolabyrinthine disturbance. A disorder of the peripheral labyrinth can be excluded easily, for there is either an isolated vestibular disturbance or, if the cochlear nerve becomes involved, a difference in the time of the appearance of involvement of the two nerves. Moreover, the duration of the nystagmus and the reduced or negative vestibular reaction after a long period speak against an endolabyrinthine involvement. The vestibular disorder produced by meat poisoning closely resembles that which Ruttin observed in a case of carbon monoxide poisoning. The vestibular symptoms may persist for several weeks or even months. The author considers protein therapy the most effective treatment.

EDITOR'S ABSTRACT.

Pharynx

LATEST DEVELOPMENT OF THE TONSIL PROBLEM. ADOLPHE J. PROVOST, New England J. Med. **209**:1221 (Dec. 14) 1933.

The multiplicity of fanciful theories is enough proof that the knowledge of the physiology of the tonsil is far from established. Bacteriologic studies of so-called normal tonsils usually reveal 90 per cent streptococci, from 50 to 78 per cent of which are of the hemolytic type. Other prevailing organisms are Micrococcus catarrhalis, Staphylococcus aureus, Pneumococcus and diphtheroids.

Probably the most comprehensive study has been that of Kaiser, who directed a survey of 48,000 school children, 20,000 of whom were tonsillectomized. His first reports represented the tonsils as a real factor in the causation of rheumatism, scarlet fever and chronic cardiac disease, whereas the tonsillectomized children had a greater protection against those diseases. Later, after studying 2,200 tonsillectomized children over a period of from three to ten years, he concluded that (1) late results are evident in the reduction of sore throat, cervical adenitis, otitis media, scarlet fever, diphtheria, rheumatic fever and heart disease (2) respiratory infections, such as laryngitis, bronchitis and pneumonia, are not benefited, but occur more frequently in tonsillectomized children, and (3) incomplete tonsillectomy does not protect against throat troubles.

Recently Kaiser reported the results of a study of 4,400 children; he found that chorea occurred in 1 per cent of the tonsillectomized subjects, as against 0.6 per cent of the nontonsillectomized subjects. Hence chorea does not seem to be an indication for the removal of healthy tonsils and adenoids.

Pavey-Smith performed tonsillectomy in 200 cases of subacute rheumatism, infective arthritis, fibrositis, osteo-arthritis, neuritis and sciatica and found that the younger the patient and the shorter the duration of the disease, the better the prospects of good results. Jones found that after tonsillectomy albuminuria cleared up in 13 cases in which the cause could be ascribed to focal infection. In the field of allergy, Rackemann and Tobey examined 1,074 patients with bronchial asthma and found that the tonsils have a negligible bearing on the outcome of the disease.

Provost believes that, in order to avoid doing too many operations, one must always bear in mind that an operation should be attempted only in the presence of clear and definite indications. GENGENBACH, Denver. [AM. J. DIS CHILD.]

WHAT CAN WE DO TO DIMINISH THE NUMBER OF TONSIL OPERATIONS? T. B. LAYTON, Lancet **1**:117 (Jan. 20) 1934.

Dawson accurately described changes in the palate that impair its efficiency and that may result from an "operation of perfection." The operation for the removal of tonsils has a greater number of complications in regard to life, to immediate illnesses and to postoperative impairment of function than any other operation of the same magnitude.

The operation is never "absolutely necessary." There is no case of rheumatism, nephritis or other disease in which tonsillectomy has not been done and in which one can say with confidence that the disease would not have occurred or would not have progressed had the operation been performed at some previous time. There is no evidence as yet to show that the generation which has grown up in the age of tonsillectomy is any fitter than the previous generation.

Seldom can one say that the tonsils are "obviously diseased." It is probable that there is no operation on which a decision is more rapidly made or one in which it is more necessary to weigh the pros and cons.

Decision should not be made at the first examination. Delay up to six months or even longer is never harmful.

The three groups of persons whom Layton has found it hardest to oppose are: (1) the medical officers in charge of public and private schools, (2) the medical

officers inspecting children in country council schools and (3) the physicians—in Layton's opinion, the most difficult group to oppose.

LANGMANN, New York. [AM. J. DIS. CHILD.]

CLINICAL AND PATHOLOGIC ASPECTS OF CHRONIC TONSILLITIS AND OF CHRONIC IRRITATION OF TONSILLAR CRYPTS. E. E. ERTL, Monatschr. f. Ohrenh. **68**:1419 (Dec.) 1934.

Ertl shows that the changes which Dietrich designated as characteristic of chronic tonsillitis are found also in patients whose anamnesis reveals no history of tonsillar disturbances and who have no clinical symptoms that are indicative of tonsillar disease, with the exception of detritus (intermingled with leukocytes) in the lacunae. In spite of the fact that the pathologic process in chronic tonsillitis is usually more severe, it is not always possible to differentiate between these two disturbances on the basis of the number and the extension of the pathologic processes. An increase in the number of leukocytes in the lacunar streak demonstrates that pathologic processes can be present in the crypts and not disclosed by the anamnesis. Thus it is understandable how careful clinical examination discloses the fact that 71 per cent of the patients who have no history of tonsillar disturbances and whose tonsils are free from signs of inflammation have an increased number of leukocytes in the tonsillar lacunae. The inflammation that develops in the lacunae is caused by the retention of cell rests and later of bacteria and fungi in the crypts. This retention is due to the fact that the cleansing of the crypts is more difficult because of the presence of scar tissue, postinflammatory adhesions, cavities and pockets and because of the constriction of the lacunae resulting from hypertrophy of the tonsils. The ratio of lymphocytes to leukocytes found in the streak does not warrant the drawing of conclusions as to the presence elsewhere of rheumatism, for instance, for the ratio fluctuates not only in different patients who have the same symptoms but also in the same patient at different times.

EDITOR'S ABSTRACT.

TONSILLECTOMY IN ENDOCARDITIS. F. CURTIUS, W. DIEKER and E. WIRTH, München. med. Wchnschr. **81**:89 (Jan. 19) 1934.

Tonsillectomy was performed on twenty-nine of forty-one patients with endocarditis during the afebrile interval and on twelve during the acute stage. Technically it is not difficult to operate during the acute stage, although there is a greater tendency to hemorrhage, and the postoperative temperature is higher. However, the ultimate results in the acute cases were not satisfactory. In eight cases of subacute bacterial endocarditis the course was not affected by the operation. The cardiac condition improved in thirteen patients, and in fourteen there was improvement of the septic and rheumatic manifestations. If there are signs of decompensation before the operation, no benefit results, and the course is progressively worse. Involvement of the kidneys is not a contraindication to operation.

BRAHDY, Mount Vernon, N. Y. [AM. J. DIS. CHILD.]

Larynx

PROTRACTED FRACTIONAL IRRADIATION (COUTARD'S METHOD) IN THE TREATMENT OF MALIGNANT GROWTHS OF THE LARYNX AND PHARYNX. E. WESSELY, Monatschr. f. Ohrenh. **68**:1351 (Nov.) 1934.

Wessely shows that the peculiar structure of the larynx and its position at the site where the respiratory and digestive tracts cross are the sources of certain dangers during and after roentgen treatment according to Coutard's method. Roentgen irradiation for the purpose of producing an irradiation epithelitis can be compared with a serious operation. Consequently it is necessary to select the cases carefully. Advanced tuberculosis, great age, cachexia, heart disease and renal disorders are contraindications to this treatment. In order to prevent infection it

is necessary to remove all carious teeth and tartar and enforce strict oral hygiene. The following factors make it necessary to discontinue roentgen irradiation: (1) if only one field can be employed and if the maximal dose is ineffective, (2) if, instead of the usual general irritation, signs of cachexia appear and (3) if high fever develops, for this may be the sign of pneumonia or of a local complication (phlegmon, perichondritis). It is necessary to interrupt roentgen irradiation or continue it with reduced doses if the local reaction of the mucous membrane (edema) appears too early or is too fulminant. However, it should be considered that a longer interruption of the treatment makes complete success impossible, and for this reason it is necessary to weigh carefully whether interruption or complete cessation of treatment is advisable. The author expresses the belief that the reaction of the mucous membrane is not an entirely reliable indicator of the effect that has been produced on the tumor. It should also be considered that in case of resistance to x-rays it is impossible to resort immediately to surgical intervention and that, because of this, valuable time may be lost. On the other hand, operation may be followed by roentgen irradiation. The author concludes that roentgenotherapy of malignant tumors of the larynx and pharynx according to the Coutard method represents a considerable advance in the treatment of malignant growths. The manifold difficulties encountered in carrying out this treatment and the proper individualization that is essential require the close collaboration of the roentgenologist and the laryngologist. Whether the retrogression of the tumor which is effected by irradiation signifies definite cure can, of course, be decided only after five years have elapsed.

EDITOR'S ABSTRACT.

PHONASTHENIC DISTURBANCES OF THE VOICE DUE TO UNILATERAL DISEASE OF THE MUSCULATURE OF THE VOCAL CORDS. R. IMHOFER, Monatschr. f. Ohrenh. **68**:1378 (Nov.) 1934.

Imhofer concludes that he cannot state with absolute certainty that the changes he observed in phonasthenic disorders were really muscular tears. However, he stresses the close resemblance of the laryngoscopic and clinical pictures with those that are observed following operative injuries of the vocal cords. At any rate, there are a group of disorders of the voice that have the symptoms of severe phonasthenia and in which noticeable laryngoscopic changes are observed in one vocal cord. Stroboscopy reveals changes that are not present in phonasthenia and that are not amenable to measures ordinarily effective against phonasthenia. In contradistinction to ordinary phonasthenia, the prognosis is unfavorable. Whether these cases should be listed with those of phonasthenia or should be differentiated from it will require further investigation.

EDITOR'S ABSTRACT.

UNILATERAL INFLAMMATION OF THE LABIUM VOCALE DUE TO VASOMOTOR DISTURBANCE (MONOCHORDITIS VASOMOTORIA). J. TARNEAUD, Monatschr. f. Ohrenh. **68**:1440 (Dec.) 1934.

Tarneaud shows that reddishness of one labium vocale may result from a vasomotor disturbance, which is of the nature of a reflex, and thus belongs to the sympathicovocal syndrome. The prolonged inflammation may produce an atrophic (dystrophic) condition of the labium vocale. In the author's cases the vascular paralysis was of intestinal and ovarian origin but was further exacerbated by vocal activity. The etiology of this type of monochorditis is thus connected with an organic disturbance in the homolateral sympathetic sphere. The differentiation of this disorder from laryngeal tuberculosis requires a general examination and continuous supervision of the patient. The absence of infiltration in the labium vocale is a diagnostic sign. Vasomotor monochorditis differs from catarrhal laryngeal disorders by its unilaterality and by its persistence. Local medicinal therapy and vocal exercises are ineffective. The therapy should be directed against the organic disorder that causes the sympathetic disturbance. The prognosis is unfavorable, and it is impossible for the patient to be a professional singer.

EDITOR'S ABSTRACT.

Miscellaneous

CONGENITAL ATRESIA OF THE ESOPHAGUS. R. H. McCLELLAN and THEODORE O. ELTERICH, Arch. Pediat. **51**:171 (March) 1934.

Two cases of congenital atresia of the esophagus are reported.

WADDELL JR., University, Va. [AM. J. DIS. CHILD.]

ARGYRIA: REPORT OF TWO CASES IN CHILDREN. H. K. BERKLEY, J. A. M. A. **102**:202 (Jan. 20) 1934.

The intranasal use of colloidal silver preparations in cases of infections of the upper respiratory tract in children has been rather widespread. Many times the preparation prescribed by the physician is used for protracted periods without his knowledge. Argyria from the use of these preparations has been reported; Berkley reports two more cases. The unsightliness and irremediable character of the ailment are sufficient to urge more care in the use of these preparations by physicians. Patients or parents should be warned of the dangers inherent in the medication.

BONAR, Salt Lake City. [AM. J. DIS. CHILD.]

SOMATIC OBSERVATIONS ON STUTTERERS. M. SEEMANN, Monatschr. f. Ohrenh. **68**:895 (Aug.) 1934.

The problem of stuttering, according to Seemann, has passed through stages similar to those traversed by the question of the neuroses. For a time bodily changes were searched for in the hope that an anatomopathologic site in the brain might be found. As this failed, psychologic factors were considered in the etiology. In Seemann's series of 300 patients who had been carefully examined from an otorhinolaryngologic standpoint, 75 of 155 boys up to the age of 14 had enlarged adenoid vegetations. Fifteen of 33 girls of the same age group also had enlarged adenoids. Of the combined 188 children, 90, or 47.8 per cent, had enlarged adenoids. It is clear, however, that neither adenoid vegetations nor narrowing of the nasal passages is an etiologic factor in stuttering, though it is recognized that operative treatment of such conditions may have a favorable influence on the stuttering. Seemann expresses a belief that this influence may now be viewed in a new light: 1. The obstruction of the thoracic respiratory movements produced by a disturbance in the reflex irritability of the nose exerts a disturbing influence on the flow of speech of the stutterer. 2. The resulting decrease in the alkali reserve of the blood forces the vegetative nervous system to a changed adjustment of its normal ability in order to equalize this chronic injury. 3. The observations of Lüscher and Šercer, which show that the obstructed nasal breathing leads to an overloading of the blood with carbon dioxide, agree with the theory of Starr on the increased carbon dioxide content and abnormal acidity of the blood of stutterers. This theory explains the favorable action of adenoidectomy and of the operations for nasal stenosis on stutterers. The question of left-handedness in the etiology of stuttering is statistically not proved and should be considered with reserve. General bodily changes have not been found with any constancy in stutterers. Seemann reports on 260 stutterers in whom the sympathetic reflexes were examined according to the method described by Sováks. One hundred and thirty-six of these were children, and 124 were adults. In 16 children (11.7 per cent) and in 24 adults (19.3 per cent) there were normal sympathetic reflexes. Abnormal reactions were obtained in 120 children and 100 adults. Of the 120 children 18 had vagotonia; 38 had orthosympaticotonia; 52 had amphotonia, and 12 had hypotonia. Of the 100 adults 22 showed vagotonia; 42, orthosympaticotonia; 24, amphotonia, and 12, hypotonia. Thus a dyscrasia of the vegetative nervous system existed in 84.6 per cent of all the stutterers. Seemann expresses a belief that these findings are significant and may be assigned to disturbances in the function of the vegetative centers in the diencephalon.

EDITOR'S ABSTRACT.

DIATHERMY IN OTORHINOLARYNGOLOGY. B. SZENDE, Monatschr. f. Ohrenh. **68**:1062 (Sept.) 1934.

Szende states that in the otorhinolaryngologic clinic of the university of Bucharest a small high frequency diathermy apparatus is used for the treatment of various disorders. Patients with acute laryngitis, particularly those who have difficulty in swallowing, respond rapidly to treatment with diathermy, the majority recovering in from five to six days. The heat produced in the course of the treatment, in spite of the sensation of dryness it produces in the throat, has a favorable subjective effect on the patient. Of the patients with chronic laryngitis, only those who had exacerbations in the fall and spring were subjected to treatment with diathermy. These exacerbations likewise responded favorably after two or three weeks of treatment (three weekly sessions) with diathermy. In the dry laryngitides, in which formation of crusts takes place, treatment with diathermy proved ineffective. The electrodes were plates of soft lead. One electrode, 6 by 8 cm., was applied to the anterior portion, and the other one, 8 by 12 cm., to the posterior portion of the neck. The strength of the current fluctuated between 1 and 3 amperes. Each treatment lasted from twenty to thirty-five minutes, the duration being increased every day. For the treatment of nasal disorders, Szende used a nickel-plated electrode which was shaped so that it could be introduced into the nostrils. It was fastened to the handle of a fork which the patient held in his hand during the treatment. The electrode was introduced, after the nasal mucous membrane had been rendered anemic. The indifferent electrode, 3 by 6 cm., was applied either to the bridge of the nose or in the region of the malar process. The strength of the current varied between 0.3 and 1.5 amperes. Diathermy was employed especially in cases of acute rhinitis, and the results were favorable in the majority of the cases. Each treatment lasted from ten to twenty-five minutes, and the usual length of treatment was three or four minutes. In some patients a single treatment proved sufficient. Diathermy proved effective also in some cases of supra-orbital neuralgia, the one electrode being applied above the point of exit of the nerve and the other one behind the ear. Szende states that some physicians employed diathermy with more or less success in treating patients with acute suppurations of the accessory nasal sinuses. He admits that the treatment reduces the pain, but he believes that because of the danger of subsequent hyperemia it should be applied only in cases in which the pus can be discharged. Attempts to employ diathermy in cases of hay fever and ozena met with only slight success. The author applied diathermy successfully in cases of diffuse chondroperichondritic processes of the external auditory meatus and in furunculosis. Acute and chronic disorders of the middle ear likewise can be subjected to diathermy. However, the disturbances of the internal ear are not suited for treatment with diathermy. Szende uses metal electrodes for the treatment of the ear. One electrode is introduced into the external meatus and the indifferent electrode is applied to the neck. The strength of the current varies between 0.3 and 1.5 amperes and the duration of the treatment between five and twenty minutes. EDITOR'S ABSTRACT.

LOGOPEDICS IN HUNGARY. A. SCHULMANN, Monatschr. f. Ohrenh. **68**:1458 (Dec.) 1934.

Schulmann states that logopedics has been studied in Hungary for the past forty-four years. After mentioning the work of some of the men who promoted this science during the earlier years the author lists the different logopedic institutes, schools and laboratories to be found now in Hungary. EDITOR'S ABSTRACT.

Society Transactions

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY

Regular Monthly Meeting, March 4, 1935

FRANK J. NOVAK, M.D., *President, in the Chair*

CARCINOMA OF THE TONGUE. DR. T. C. GALLOWAY.

This patient was shown to demonstrate what team-work can do in cancer. The patient had a carcinoma on the right side of the posterior third of the tongue. I ligated an external carotid artery and coagulated the tissue around the growth well, and about one month later Dr. Samuel J. Pearlman resected a gland. Dr. A. T. Larkin applied a radium collar for a dose of 9,600 mg. hrs. The result seems rather good, but is not reported as a cure since it is of only two years' duration.

CHONDROMYXOSARCOMA OF THE NOSE. DR. T. C. GALLOWAY.

This 15 year old boy came for an examination because of nasal blocking of eighteen months' duration. He presented polypoid masses filling the left nostril and half of the nasopharynx, with fulness over the left cheek. At first it seemed almost impossible to consider removal of the polypoid tissue but this finally proved to be rather easy.

Dr. R. H. Jaffé reported that the biopsy showed chondromyxosarcoma and stated that the tumor was rather malignant and might give extensive metastases because of its tendency to grow into blood vessels.

Radium was used in the nose, also through a Caldwell-Luc incision and through a split of the soft palate, to shrink the tumor and reduce its vascularity, but with little effect. Finally, after ligation of the external carotid artery, the mass was removed through a 5 cm. lateral rhinotomy with no great difficulty though it completely filled the nasal chamber, the antrum and half of the nasopharynx. It arose from the naso-antral wall and was smoothly encapsulated, though there were adhesions at the points of previous attack. These were destroyed with electrocoagulation as was the area of origin. The scar is slight, the patient has gained 15 pounds (6.8 Kg.), and the outlook seems good.

GLOSSECTOMY (COMPLETE) FOLLOWING CARCINOMA. DR. SAMUEL J. PEARLMAN.

On March 7, 1933, this man, aged 69, first came to the Ear, Nose and Throat Clinic of the Cook County Hospital complaining of a growth on the tongue which had been present for the past five months. Examination showed the left side of the tongue to be enlarged to about three times the normal size. The midportion of the tongue was very firm. There was no ulcer or palpable cervical gland.

It was my impression that the patient had a carcinoma of the tongue, and a biopsy and a Wassermann test of the blood were ordered. The Wassermann reaction was 4 +. The biopsy proved the growth to be a hornifying squamous cell carcinoma. The patient was given treatment with potassium iodide and mercurial inunctions, and three days later he was operated on.

A preliminary ligation of the left external carotid artery and of the right lingual artery was done. Then, with a cutting current, a complete glossectomy was performed.

The postoperative course was uneventful. The wound healed without difficulty, and the patient was discharged on April 10, with instructions to return periodically to the clinic for continuous observation.

The pathologic report on the excised tongue follows: "The specimen is a tongue 11 by 8 by 2 cm. The anterolateral surface is distorted by a tumor mass 2.5 by 5.5 cm., which extends only to the midline. This mass is elevated, papilliferous and firm. Microscopic examination shows the mass to be a hornifying squamous cell carcinoma."

CARCINOMA OF NASOPHARYNX WITH METASTASES TO REGIONAL CERVICAL GLANDS IN A NEGRO BOY, AGED 10. DR. SAMUEL J. PEARLMAN.

This Negro, aged 10, entered the Cook County Hospital on March 8, 1934, complaining of a swelling on the right side of the neck of six weeks' duration, associated with a discharge from the right ear. The patient's mother stated that the right ear had shown a discharge eight years ago and again in November 1933, after which the discharge persisted until Feb. 10, 1934, when it stopped spontaneously. Two weeks before the ear became dry a swelling appeared just below the tip of the right mastoid process. The swelling had not increased in size since it was first noted.

Examination revealed a fairly well nourished Negro boy who did not appear acutely ill. The temperature was 99 F.; the pulse rate was 74 and the respiratory rate 20. The head and scalp were essentially normal. The pupils reacted to light and in accommodation; there was no nystagmus. The tonsils were small and atrophic; the pharynx, normal. The left ear was essentially normal. The canal of the right ear was clean. The drum was thickened and scarred, but there was no bulging or visible perforation. The neck showed no rigidity. Below the tip of the right mastoid a lemon-sized, smooth, fairly firm swelling was found, which was not tender on palpation. There were no other palpable glands. The rest of the physical examination gave essentially negative results.

The impression at the time of examination was that the patient had a chronic adenitis, probably tuberculous. Biopsy was recommended. A roentgenogram of the chest revealed increased width of the upper part of the mediastinal shadow.

On March 12 the gland was removed. The pathologic report follows: "The specimen is a mass of tissue 7 by 3.5 by 2.5 cm., which appears to be made up of lymph nodes. There is a central firm node, 3 cm. in diameter, which, when sectioned, shows a yellowish-gray cut surface. Microscopic examination shows the nodes to be metastases of a very undifferentiated transitional cell carcinoma."

Following the pathologic report a search was made for the primary focus and the adenoids were removed. They were fairly firm in texture and microscopically showed malignant changes similar to those of the glands.

On April 13, a radium collar was applied which was made up of three blocks, each containing 12.5 mg. of radium. This was left on for six days, giving a total dose of 5,400 mg. hrs. On April 27, two 25 mg. radium needles were inserted into the nasopharynx for twelve hours.

At present there is no adenopathy or sign of distant metastasis. The nasopharynx is clear, and the child appears to be in good health.

TONSILLAR CALCULUS. DR. JOHN A. CAVANAUGH.

A Negro boy, aged 13, presented himself at the Illinois Eye and Ear Infirmary complaining of a sore throat, most marked on the left side. His mother had from time to time painted his throat with a solution of iodine. She stated that five years ago, while he was playing with a stick of wood between the teeth, he fell forward, pushing the stick into his throat. Since then the throat had been sore.

The tonsils were enucleated by my intern, Dr. Boyce. The right tonsil was easily removed, but the left was adherent, and a great mass of adhesions made it difficult to free the tonsil. In the center of the tonsil a calculus was found, 11 mm. long and 9 mm. wide. A small splinter of wood protruded for a distance of 3 mm. from one end. A thick fibrous capsule of connective tissue surrounded the mass, and little lymphoid tissue remained.

GUMMA (NECROTIC). DR. WALTER H. THEOBALD.

E. S., a white boy, aged 15, was admitted to the Research and Educational Hospital of the University of Illinois on Nov. 1, 1933 because of a lesion under the left ear. He stated that this was first noted about two and a half months previously, and that it had extended onto the left cheek during the past two months. During this time ulceration had developed in the involved area, and multiple lesions had appeared along the left clavicle. He had lost some weight but could not estimate how much. There had been some coughing with expectoration during the past three weeks and occasional night sweats. He stated further that there had been a discharge from the left ear for the past five months. Otherwise the history was essentially irrelevant.

Examination showed the left cheek swollen to about the size of half an orange, which made it difficult for the patient to open his mouth. The cheek was cyanotic and indurated but not tender. In the center of this area was an ulceration about 1½ inches (about 3.8 cm.) in diameter with an irregular border. The base of the ulcer was covered with a brownish crust. Behind the left ear there was an open sinus, posterior to which was another indurated area which extended downward about 1 inch (2.5 cm.) to another ulcerated area a short distance above the left clavicle. This had the appearance of a Bezold abscess. A scar about 1½ inches long was present beneath the ramus of the left mandible. An indurated area was noted above the right clavicle, and another ulcerated area just medial to this. Two freely movable palpable glands were present on the right side of the neck. Otherwise the results of physical examination were essentially negative.

The blood showed: erythrocytes, 3,100,000 per cubic millimeter; leukocytes, 8,150; hemoglobin, 80 per cent. The differential count was: polymorphonuclears, 64 per cent; lymphocytes, 28 per cent; large mononuclears, 8 per cent. The Wassermann and Kahn reactions of the blood serum were 4+. The sputum showed no tubercle bacilli, and a roentgenogram of the chest revealed no abnormal shadow.

A biopsy section from a lesion on the face disclosed a rather poorly defined fibrinous stroma densely infiltrated with glandular and cellular débris. Here and there were smaller arterioles which displayed a marked perivascular proliferation of connective tissue and proliferation of the endothelial lining. The diagnosis was gumma.

The patient was treated with potassium iodide and mercury with chalk.

About Jan. 1, 1935, he began to complain of pain in his left ear. A few days later he began to have an intense headache, some stiffness of the neck, vomiting and paralysis of the left side of the face. He was taken to the Cook County Hospital on January 11, where a spinal puncture revealed fluid under increased pressure, with 120 cells. A radical mastoidectomy was performed, and the patient's symptoms subsided. Since then the facial paralysis has partially cleared up.

METEOROLOGICAL FACTORS IN OTOLARYNGOLOGIC PRACTICE. DR. WILLIAM F. PETERSEN, Professor of Pathology and Bacteriology, University of Illinois (by invitation).

The first scientific interpretation of disease associated with change in the environment is to be found in the hippocratic text "Airs, Waters, Places"—there meteorology is established as a prerequisite to the study of medicine.

The peculiarities of the American environmental conditions devolve about the fact that the circumpolar cyclonic circulation of the atmosphere is unusually sharply defined and unusually severe.

Each person in the community must adjust continuously to these alterations, and this adjustment involves every physiologic phenomenon of the body. With each polar infall there is a period of vascular spasm and relative anoxia, and during this time the blood is more alkaline, anabolism preponderates, and the blood pressure rises.

As a result of the changes associated with the anoxemia active substances accumulate in the capillaries, tissues are stimulated, the blood pressure falls, the

basal rate increases, and a tissue status diametrically opposite to that which previously obtained preponderates.

If in any region of the body pathologic foci (locus minoris resistantiae) exist, the possibility is great that clinical symptoms will be precipitated at the maximum development of either a pressor or a dilator phase.

When a quiescent focus of infection is present, such a change in the status of the tissue may so alter the host-parasite relationship that activation follows (exacerbation of the infection). (A number of otolaryngologic case records were used to illustrate the relationship.)

DISCUSSION

DR. JOSEPH C. BECK: I appreciate, as all of you, the work that Dr. Petersen has presented, and of course I have a lot of questions I should like to ask. Particularly, is there any place in the world where one may not be exposed to all these things? Would Honolulu be a good place? They say that is the garden spot of the world. I was there once and found that they have all the diseases that people here have and many more. I wish, however, to ask Dr. Petersen a personal question as to the matter of health conditions. For thirty-five years I have suffered from a cardiac condition, namely, arrhythmia, and as I grow older it becomes more frequent, lasting eight, ten or twelve hours, and all the doctors say there is nothing wrong with my heart. Is this something due to the atmospheric conditions or whatnot? Dr. Petersen spoke of epilepsy. I have been interested in that subject; one speaks of it as allergic states that develop periodically. I should like to have him touch on that point.

Another thing, for years migraine has been present in my family, in very severe form, but when this cardiac condition developed I lost my migraine.

DR. SAMUEL J. PEARLMAN: Is Dr. Petersen aware of any studies in which the various conditions have been standardized, in which the temperature and other factors are controlled? What are the changes that take place under those circumstances?

DR. ROBERT SONNENSCHEIN: I wish to add a word of admiration for the marvelous presentation which Dr. Petersen has made.

Let me sound a personal note, and that is this: For many years I suffered from headache (not the financial ones of recent date), and I noticed that on murky days with low barometric pressure I seemed to have more headache than when the atmosphere was clear and the barometer high. I cannot say that these attacks occurred only when the temperature was rising and the barometer vice versa, but I wonder whether change in the atmosphere had something to do with the headaches, which were quite frequent.

DR. WALTER H. THEOBALD: Dr. Petersen's presentation is so fantastic and intriguing that I have probably become a bore to him in my visits to his laboratory, but I was so impressed that I tried to follow this matter up in two cases. Last winter I examined a patient on Sunday so that I could give plenty of time to the ears. The case was one of deafness of syphilitic origin. Some months later I was dining with Dr. Petersen, and we discussed this case. He asked me to look up the date on which the sudden deafness took place. I looked up the patient's records, and sure enough, the temperature had dropped and the barometer had gone up at the time when his deafness appeared with sudden onset.

I have been observing for some time a case of dizziness, not one of Ménière's syndrome but one in which there is evidence of vasomotor disturbance. It is difficult to obtain the presence of a patient every day to take the blood pressure, but I prevailed on this man to let me do so. His worst vertigo occurred during the early part of January when there was a lot of cold weather. His dizziness was most severe when the temperature was lowest, which I reported to Dr. Petersen, and he could point out to me the fall in temperature and the rise in barometric pressure when this patient was having his greatest trouble. In better weather he seemed to improve. On the basis of this work of Dr. Petersen's and the work that Dr. A. C. Furstenberg of Ann Arbor, Mich., is doing, I tried to

control the water balance of the patient, and while this has been under observation for only two weeks the man is better since I began treating him with large doses of ammonium chloride. His vertigo was so bad on one occasion that he could not go to his office for two days.

In the treatment, since there is no way of changing the temperature or the barometric pressure, can one change oneself in any way to prevent these things?

Dr. Frank J. Novak: I should like to ask whether any observations were made in cases of frontal sinus disease in which patients have sinus changes apparently for no reason at all at certain definite periods. The patient will suddenly present a blocked sinus and then, with no changes in the mucosa or in the soft tissues of the nose, he will improve and be all right. Has this been correlated in any way with temperature changes?

Dr. William F. Petersen: These patients of whom I speak are all in the hospital and under relatively constant environmental conditions with regard to food, housing and the like.

One apparently deals with a complicated reflex mechanism that involves all the autonomic mechanism and fundamental changes in oxidation. The effect is not due only to a change in environmental temperature; there are many other atmospheric alterations that are associated and usually synchronized.

Every person varies to a degree. For instance, some patients subject to eclampsia will have attacks at the very moment of barometric change; others, a few hours afterward. The same thing holds true for migraine, epilepsy, etc.

As far as stabilization of conditions is concerned, I can state that experiments have recently been made in California in which persons were kept in pressure chambers for long periods of time, and during this period of stabilization no colds occurred. As a matter of fact, when children with such conditions as sore throat, tonsillitis and arthritis are sent from an unstable atmospheric region such as New York to semitropical islands, the clinical evidences of these infections disappear but reappear as soon as they are returned to New York.

As far as the questions of my friend Dr. Beck are concerned, I suggest that his cardiac arrhythmia is an equivalent of migraine. Other persons may acquire mild forms of epilepsy, aphasias or tachycardias. If one will observe the definite dates, it will be found that these attacks almost invariably occur in association with a polar infall. It is for this reason that one's friends who can afford to do so go to Arizona or California to avoid the meteorological instability.

To what extent the metabolic rate is influenced depends on the patient. I have, for instance, watched young men of relatively sluggish metabolic trend. During the late winter and early spring, it is occasionally found that the basal rate may actually be +50. This occurs as the result of cumulative meteorological insults. The same men during the summer will have rates around + 10 or — 10, and a careful analysis of day by day determinations will reveal that one is dealing with a perfectly normal rhythm of increasing and decreasing basal rates that reflect the meteorological environment. As a matter of fact, Benedict has called attention to this probability.

In Hawaii they do not have all the diseases that people of the mainland have. They have relatively few focal infections, little or no gastric ulcer, much less migraine, colitis, etc. However, they do have what is called the "Kona" or the "sick wind." When the trade winds cease and a shift occurs to the south, many people suddenly become ill with colds, asthma, etc. It is for this reason that the ancient Hawaiians used the term "Kona" to indicate the "sick wind."

Patients sometimes describe what they call a "Sunday headache." Why? Because many people change their normal routine, sleep longer, take less exercise (produce less acidity) and are apt to indulge in heavy meals. Their smaller blood vessels close, their blood pressure goes up, and they have headache.

In the tropics the only real period of fluctuation occurs at the transition between the rainy season and the dry and between the dry and the rainy season. At such times clinical activity is apt to begin. They do not have barometric fluctuations.

In our region of the world the barometric variability is great, and it is something that one cannot avoid, although everyone tries to control the body temperature by proper clothing and shelter.

Concerning therapy, some of the unstable patients can be changed by administration of sex hormones; others can be treated with nonspecific or with specific vaccines. With these given at proper intervals one apparently is able to break up some of the major metabolic fluctuations and so stabilize the patient. In other patients the right amount of rest and exercise will be salutary, or a ketogenic diet may be found useful. No matter what the method, the ultimate mechanism usually involves a stabilization of the patient or the securing of a better adaptability and responsiveness to the environmental alteration. Fundamentally one must have the patient avoid undue change in the blood pressure, and I don't have to stress that when one deals with these unstable types the treatment must be distinctly individualized.

Directory of Otolaryngologic Societies *

FOREIGN

Collegium Oto-Rhino-Laryngologicum Amicitiæ Sacrum

President: Prof. Gunnar Holmgren, Karolinska Mediko Kirurgiska Institut, Stockholm, Sweden.
Secretary: Prof. Dr. C. E. Benjamins, Verlengde Heereweg, 143, Groningen, The Netherlands.

NATIONAL

American Medical Association, Scientific Assembly, Section on Laryngology, Otology and Rhinology

Chairman: Dr. Ralph A. Fenton, 1020 S. W. Taylor St., Portland, Ore.
Secretary: Dr. Gordon B. New, Mayo Clinic, Rochester, Minn.
Place: Kansas City, Mo. Time: 1936.

American Academy of Ophthalmology and Otolaryngology

President: Dr. Wells P. Eagleton, 15 Lombardy St., Newark, N. J.
President-Elect: Dr. Frank E. Burch, 408 Peter St., St. Paul.
Executive Secretary: Dr. William P. Wherry, 1500 Medical Arts Bldg., Omaha.
Place: Cincinnati. Time: Sept. 14-20, 1935.

American Bronchoscopic Society

President: Dr. Henry Hall Forbes, 40 E. 61st St., New York.
Secretary: Dr. Lyman Richards, 319 Longwood Ave., Boston.

American Laryngological Association

President: Dr. Dunbar Roy, 113 N. Pryor St., Atlanta, Ga.
Secretary: Dr. W. V. Mullin, 9204 Euclid Ave., Cleveland.

American Laryngological, Rhinological and Otological Society, Inc.

President: Dr. Perry G. Goldsmith, 170 St. George St., Toronto, Canada.
Secretary: Dr. R. L. Loughran, Sharon, Conn.

SECTIONS:

Eastern.—Chairman: Dr. Frederick T. Hill, Professional Bldg., Waterville, Maine.
Southern.—Chairman: Dr. Beverly R. Kennon, Medical Arts Bldg., Norfolk, Va.
Middle.—Chairman: Dr. Daniel W. Layman, Medical Arts Bldg., Indianapolis.
Mid-Western.—Chairman: Dr. Edward H. Cary, Medical Arts Bldg., Dallas, Texas.
Western.—Chairman: Dr. Frank A. Burton, Bank of America Bldg., San Diego, Calif.

American Otological Society

President: Dr. Francis R. Packard, 304 S. 19th St., Philadelphia.
Secretary: Dr. Thomas J. Harris, 104 E. 40th St., New York.

* Secretaries of societies are requested to furnish the information necessary to keep this list up to date.

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